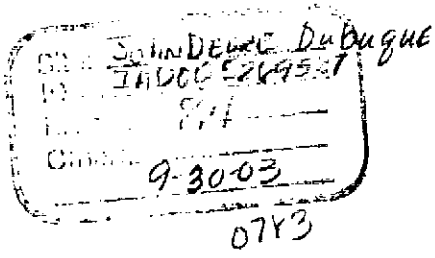


FIVE-YEAR REVIEW REPORT

Third Five-Year Review Report

March 1998 to September 2003

For

John Deere Dubuque Works

Dubuque, Iowa

EPA ID Number: IAD005269527

Prepared by
ARCADIS
3903 Northdale Boulevard, Suite 120W
Tampa, Florida 33624

Approved by: Andrea Jirka, for

Date: 9/30/03

ARCADIS
Infrastructure, buildings, environment, communications

Third Five-Year Review Report March 1998 to September 2003

John Deere Dubuque Works
EPA ID Number
IAD005269527

Prepared for:
John Deere Dubuque Works

Prepared by:
ARCADIS
3803 Northdale Boulevard
Suite 120W
Tampa
Florida 33624
Tel 813 961 1921
Fax 813 961 2599

Our Ref.:
TF001034.0012.00001

Date:
25 September 2003

Contents

Figures

Tables

Contents

Appendices

LIST OF ACRONYMS

ARARs	Applicable or Relevant and Appropriate Requirements
BOD5	Biochemical Oxygen Demand
BTEX	Benzene, Toluene, Ethylbenzene, and Xylenes
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
FS	Feasibility Study
ft^2	Square Feet
HAL	Health Advisory Level
HRS	Hazard Ranking System
IDNR	Iowa Department of Natural Resources
IRIS	Integrated Risk Information
JDDW	John Deere Dubuque Works
kg	Kilogram
lbs/day	Pounds per Day
MCLs	Maximum Contaminant Levels
mg/kg-day	Milligrams per Kilogram Day
mg/L	Milligrams per Liter
msl	Mean Sea Level
NAPL	Non-aqueous Phase Liquid
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NRL	Negligible Risk Level
O&M	Operation and maintenance
PCE	Tetrachlorethene
PRP	Potentially responsible party
RA	Remedial Action
RAOs	Remedial Action Objectives
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
TCE	Trichloroethene
TTO	Total Toxic Organic
ug/L	Micrograms per Liter

USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
VOCs	Volatile Organic Compounds

[This page intentionally left blank.]

EXECUTIVE SUMMARY

The remedy for the John Deere Dubuque Works site in Dubuque, Iowa includes pumping groundwater from the alluvial aquifer using the existing production wells to maintain an inward hydraulic gradient. The remedy also includes using deed restrictions to prevent inappropriate use of the plant property in the future. In addition, wells tapping the alluvial aquifer beneath the JDDW property for the purpose of extracting water for human drinking purposes or for irrigation of food or feed crops are not allowed.

According to the data reviewed, the site inspection, and the interviews, the remedy is functioning as intended by the ROD. There have been no changes in the physical conditions of the site that would affect the protectiveness of the remedy. The selected remedy remains protective of human health and the environment and complies with Federal and State requirements that are applicable or relevant and appropriate to this remedial action. Therefore, this remedy continues to be protective to human health and the environment.

Third Five-Year
Review Report
April 1998 to
September 2003

John Deere Dubuque
Works
Dubuque, Iowa

[This page intentionally left blank]

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site name *(from WasteLAN)*: John Deere (Dubuque Works)		
EPA ID *(from WasteLAN)*: IAD005269527		
Region: VII	State: Iowa	City/County: Dubuque/Dubuque
SITE STATUS		
NPL status: G Final X Deleted G Other (specify)		
Remediation status (choose all that apply): G Under Construction X Operating G Complete		
Multiple OUs?* G YES X NO	Construction completion date: ___ / ___ / _____ N/A	
Has site been put into reuse? G YES X NO		
REVIEW STATUS		
Lead agency: X EPA G State G Tribe G Other Federal Agency _____		
Author name: Katherine Thalman		
Author title: Project Scientist II	Author affiliation: ARCADIS	
Review period:** 4/1/98 - 9/25/03		
Date(s) of site inspection: 08 / 07 / 03		
Type of review: G Post-SARA G Pre-SARA G NPL-Removal only X Non-NPL Remedial Action Site G NPL State/Tribe-lead G Regional Discretion		
Review number: G 1 (first) G 2 (second) X 3 (third) G Other (specify) _____		
Triggering action: G Actual RA Onsite Construction at OU #____ G Actual RA Start at OU#____ G Construction Completion X Previous Five-Year Review Report G Other (specify)		
Triggering action date *(from WasteLAN)*: 09 /30 /98		
Due date *(five years after triggering action date)*: 09 /30 / 03		

* ["OU" refers to operable unit.]

** [Review period should correspond to the actual start and end dates of the Five-Year Review in WasteLAN.]

Five-Year Review Summary Form, cont'd.

Issues:

No issues were found during the third five-year review.

Recommendations and Follow-up Actions:

Recommendations based on this third five-year review include the following. JDDW should continue to monitor and maintain the inward hydraulic gradient; monitor the presence of NAPL and perform NAPL recovery as necessary; and monitor the surface water and groundwater.

JDDW requests that USEPA approve abandoning monitor well MW-13D. MW-13D has not had contaminant exceedences (inorganic or organic) in Performance Standards since 1990 (Appendix B). Relative to SBW-4, EPA approved abandoning SBW-4 during the second five year review; however, the abandonment of this well was delayed because NAPL was detected in the well. JDDW will develop and submit to EPA a plan detailing the monitoring program that will be implemented. Additionally, JDDW requests that USEPA approve reducing the river stage monitoring of the Mississippi River to monthly at the same time as the monitor well water levels since this data is only used in the development of site water table maps.

Protectiveness Statement(s):

The selected remedy remains protective of human health and the environment and complies with Federal and State requirements that are applicable or relevant and appropriate to this remedial action. Therefore, this remedy continues to be protective to human health and the environment.

Other Comments:

Third Five-Year Review Report
April 1998 to March 2003

John Deere Dubuque Works
Dubuque, Iowa

1 Introduction

The United States Environmental Protection Agency (USEPA), Region VII, has conducted a five-year review of the remedial actions implemented at the John Deere Dubuque Works (JDDW) in Dubuque, Iowa. This review was conducted for the period December 2002 through September 2003. This report documents the results of the review. ARCADIS was contracted by JDDW to conduct an analysis in the support of the five-year review.

The purpose of five-year reviews is to determine whether the remedy at a site is protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in Five-Year Review reports. In addition, Five-Year Review reports identify issues found during the review, if any, and recommendations to address them.

The USPEA is preparing this five-year review pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) §121 and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). CERCLA §121(c) states:

> *If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, and the results of all such reviews, and any actions taken as a result of such reviews.*

The agency interpreted this requirement further in NCP; 40 Code of Federal Regulations (CFR) § 300.430(f)(4)(ii):

> *If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such*

action no less often than every five years after the initiation of the selected remedial action.

This is the third five-year review for the JDDW site. The first five-year review was completed in September 1995 and the second five-year review was completed in September 1998. Subsequent five-year reviews should be completed no later than five years following the signature of the previous Five-Year Review report. The triggering action for this statutory review is the date of completion of the second five-year view (September 1998) as shown in USEPA's WasteLAN database. This Five-year review is required because the JDDW remedial action resulted in hazardous substance, pollutants, or contaminants remaining on site.

2 Site Chronology

A chronology of site events for the JDDW site is presented in Table 1.

3 Background

3.1 Physical Characteristics

The JDDW plant is located approximately 2.5 miles north of the City of Dubuque in northeastern Iowa and covers 1,447 acres near the confluence of the Mississippi and the Little Maquoketa Rivers. Land surface elevations vary from 600 feet above mean sea level (msl) along the Mississippi River close to the JDDW plant to greater than 850 feet above msl on the uplands away from the river. The Mississippi River is located east of the site, and the Little Maquoketa River bisects the JDDW property and enters the Mississippi River east of the northeast facility boundary. A site map is included as Figure 1. The plant buildings are located on a relatively flat delta at the confluence of the Little Maquoketa River and the Mississippi River.

Site geology consists of alluvial sediment overlying bedrock. The alluvial sediments at the JDDW site vary in thickness from 100 to 158 feet and consist principally of fine-to-coarse grained sand deposited mainly by glacial meltwaters. A thin silty layer has also been deposited by the Little Maquoketa and Mississippi Rivers. The plant site is located above the thickest portion of the alluvium in the Peru Bottoms area. Toward the bluffs, the elevation of the bedrock increases and the alluvial deposits become thinner. Groundwater flow in the alluvial aquifer is towards the production wells.

Three distinct bedrock aquifers are present in the Dubuque Iowa area: the Galena-Platteville aquifer, Cambrian-Ordovician aquifer, and Dresbach Group aquifer. The

Galena-Platteville aquifer is comprised of the Galena, Decorah, and Platteville Formations of Ordovician age, which are the younger bedrock units in the vicinity of JDDW. These bedrock units, which consist of limestone and dolomite with shaley layers, are not present in the JDDW plant area but are found in the uplands adjacent to the River valley and at the bottom of shallow filled valleys. The Galena-Platteville aquifer yields small quantities of water adequate for domestic supply. The Galena-Platteville aquifer is underlain by the deeper-lying Cambrian-Ordovician aquifer, which is comprised of the Ordovician age St. Peter Sandstone and Prairie du Chien (Dolomite) Group and the Cambrian age Jordan Sandstone. This aquifer is a major source of water across the state of Iowa. In the JDDW plant area, the Galena-Platteville aquifer and the St. Peter Sandstone are absent and the alluvium is in direct contact with the Prairie du Chien Group of the Cambrian-Ordovician aquifer. The Cambrian-Ordovician aquifer is underlain by the St. Lawrence Formation and the Franconia Sandstone, which are relatively impermeable and provides an effective confining layer between the Cambrian-Ordovician aquifer and the deeper lying Dresbach Group. The Dresbach Group consists of the Galesville Sandstone, the Eau Claire Formation and the Mt. Simon Sandstone. This aquifer is not as productive or as widely used as the Cambrian-Ordovician aquifer.

3.2 Land and Resource Use

General land use in Dubuque County and northeastern Iowa is primarily agricultural except near major population centers. JDDW is zoned M-2 Heavy Industrial District by Dubuque County. Areas adjacent to JDDW are zoned R-1 Rural Residential to the north, which includes mostly farms; C-1 Conservancy to the east; A-1 Agricultural to the west; and C-1 Conservancy, R-2 Single Family Residential and R-3 Multifamily Residential to the south.

The JDDW site, although once farmland, remains largely undeveloped except for the immediate vicinity of the plant operations, which is located on the eastern half of the JDDW site. In 1946, JDDW began manufacturing operations in a newly constructed 600,000 square feet (ft^2) facility. A site map is included in Figure 2. Prior to 1976, several major additions to the plant were completed, predominantly to the south of the original building. As a result of these additions, the facility occupied more than 5,000,000 ft^2, which included the original plant building, storage areas, waste disposal areas, and parking lots. Since 1997, JDDW has been in the process of reducing the size of the facility by closing down and demolishing buildings. In 1997, JDDW closed down and demolished Heat Treat buildings E, E1, E2 and E3, which comprised 78,694 ft^2 (Figure 2). In 1998, JDDW closed down and demolished buildings J, K, and I used for miscellaneous manufacturing, which comprised 405,482 ft^2 (Figure 2). In early

2003, JDDW began demolishing Engine Manufacturing Buildings U, V, and V1, which comprises 448,600 ft^2 (Figure 2). The demolition of these buildings reduces the size of the facility by 932,776 ft^2.

In the past, JDDW has employed over 8,000 workers in the manufacture of heavy construction equipment including backhoes, bulldozers, and forestry equipment. As of 21 August 2003, 1630 workers are employed at the plant.

The portion of the Mississippi River adjacent to the site is part of the Upper Mississippi River Wildlife and Fish Refuge established in 1924. A CMSP & Pacific Railroad track lies between the plant and the Mississippi River and approximately 20 cottages are located between the JDDW facility and the river on the Mississippi River flood plain (Geraghty & Miller, 1990). Nineteen of the 20 cottages are leased from the United States Army Corps of Engineers (USACE) to private residents.. The remaining cottage is not owned by the USACE.

It is anticipated that the current land uses of the JDDW plant and adjacent areas will continue into the future. JDDW has a deed restriction that limits the use of the current plant property to industrial activity only.

The JDDW plant water supply is obtained from two bedrock wells (PW-1 and PW-2), six wells installed in the alluvial aquifer (PW-3A, PW-4A, PW-5, PW-6, PW-7A, and PW-8), and the Mississippi River (Figure 3). The JDDW potable water supply is currently obtained from two bedrock wells PW-1 and PW-2. Process and cooling water for the plant are provided currently by alluvial wells PW-3A, PW-4A, and PW-7A. Three production wells were replaced in the 1990's. After obtaining USEPA's approval, production well PW-3 was abandoned in April 1997 due to changes in plant production and replaced with PW-3A. Production well PW-4 was replaced with PW-4A in May 1995 and PW-7 was replaced with PW-7A in September 1995 because water being pumped from these wells contained large volumes of sand. Currently, alluvial wells PW-6 and PW-8 are reserved for fire protection and the Mississippi River supplies non-contact powerhouse cooling water. A well location map illustrating the location of production wells PW-3, PW-4, PW-5, and PW-7 is included as Figure 3. The locations of new production wells PW-3A, PW-4A, and PW-7A are also shown on Figure 3.

3.3 History of Contamination

Potential sources of environmental contamination were identified in the Remedial Investigation (RI) conducted at the JDDW site in 1988. Identified sources of

contamination included a former landfill, a foundry, a chrome basin at the industrial wastewater treatment plant, a coal storage yard, and a diesel fuel line leak located under the plant which occurred in 1980.

Throughout its history, the JDDW facility has used two separate landfills for waste disposal. The older landfill, identified as a potential source of contamination in the RI report was placed in a natural depression in the Little Maquoketa River floodplain, near the northern end of the facility. The old landfill was utilized from 1946 until 1974 and is approximately 20 acres in area. Prior to 1974, JDDW placed wastes up to the banks of the river. In 1974, the Iowa Department of Natural Resources (IDNR) required the wastes be moved to at least 140 feet from the riverbanks. The wastes were bulldozed back and fences were placed along the perimeter of the landfill. The newer landfill is not included in the Remedial Action.

Prior to 1968, wastes were placed in the low areas of the old landfill and combustible material was burned. Wastes disposed in the older landfill include caustics (sodium or potassium hydroxide), acids (hydrochloric or sulfuric), petroleum distillates (solvents, grinding oils, etc.), heavy metals (chromium, lead, and zinc used in electroplating), cyanide, paint sludges, and foundry sand containing 1% oil-based resin. The quantities of materials disposed in the old landfill are not known (Geraghty & Miller, 1991).

A fuel layer on the shallow water table resulted from an underground diesel fuel line leak in October 1980 under building G-2. An estimated 200,000 gallons of diesel fuel leaked from the line. Recovery well G-2S was installed in October 1980 and JDDW initiated fuel recovery operation on November 10, 1980. Groundwater was separated from the fuel using an oil/water separator. The recovered fuel was retained for onsite reclamation, and the water from the oil/water separator was discharged via a National Pollution Discharge Elimination System (NPDES) permitted discharge to the Mississippi River. In May 1981, recovery well G-2D was installed and used to drawdown the water table providing better recovery in well G-2S. Eighteen monitoring wells were installed between February and June 1981 to monitor groundwater quality related to the fuel spill. Groundwater monitoring results indicated that the spill was limited to an area around G-2 extending to and including PW-3. Recovery Wells RW-3, RW-4 and RW-5 were installed in 1981 near corresponding production wells PW-3, PW-4 and PW-5. In April 1982, both G-2 recovery wells were discontinued after approximately 20,610 gallons of diesel was recovered and diesel recovery at RW-3 was initiated. Diesel recovery from RW-4 was initiated in June 1982 and discontinued in November 1983 after recovering 20 gallons of diesel fuel. RW-5 did not yield measurable quantities of diesel and recovery was not initiated. By October 1985,

approximately 86,000 gallons of diesel fuel had been recovered. Locations of the monitoring wells and the recovery wells are shown on Figure 3.

3.4 Regulatory History

The JDDW facility was identified as a potential hazardous waste site on June 5, 1981. A Preliminary Assessment Report issued in July 1983 cited an initial Hazard Ranking System (HRS) score of 34.95 (low to moderate hazard). In 1984, a Site Investigation was performed, and in 1985, JDDW contracted Geraghty & Miller (now ARCADIS) to perform site studies related to the former landfill.

In September 1985, the USEPA proposed the JDDW site for inclusion on the National Priorities List (NPL). An HRS score of 28.5 is sufficient to place a site on the NPL; however, the site was never placed on the final NPL. The USEPA and Deere Co entered into an Administrative Consent Order on September 30, 1986 requiring the development of a Remedial Investigation/Feasibility Study (RI/FS) for the site. The RI/FS process was almost near completion when on June 24, 1988, the USEPA announced its new national policy in the Federal Register (53 FR 23978) whereby Resource Conservation and Recovery Act (RCRA) treatment, storage, or disposal facilities would not be placed on the NPL. As a result of this policy, the USEPA announced its intention to remove several sites, including the JDDW site, from the list of sites proposed for the NPL. One of the main purposes of this policy was to avoid spending Superfund money at RCRA sites that are subject to the corrective action authorities of RCRA. The policy does not prohibit site cleanup from proceeding under a CERCLA Consent Decree under which the potentially responsible party (PRP) funds the work. Region VII decided to continue to treat the facility as a Superfund site. Deere and Company has been the sole owner and operator of the site, is the only PRP for onsite contamination, and has funded the remedial work at the site to date.

The RI report was submitted to USEPA in August 1988. The purpose of the RI was to collect necessary data to characterize the site and to assess the potential release of hazardous materials from waste management units, waste disposal, or product leakage and/or spillage. The RI focused on potential constituent sources identified through a review of plant operations. Potential sources identified in the RI included the former landfill, the foundry (old foundry ponds), the chrome basin at the industrial wastewater treatment plant, several isolated waste oil/ coolant spills, the coal storage yard, and the 200,000-gallon diesel fuel line leak, which occurred in 1980. RI activities included collection of data to characterize air, surface water, sediments, surface soils, subsurface soils, and groundwater quality. The floating hydrocarbon was also analyzed and it was found to be predominantly diesel fuel with lesser concentrations of volatile organic

compounds (VOCs) not typically associated with diesel fuel. It was suspected that leaks occurring prior to 1980 may have contributed to the other "non-diesel" VOCs found within the floating layer. The floating layer was renamed non-aqueous phase liquid (NAPL).

Low concentrations of VOCs were detected in the alluvial aquifer groundwater underlying the JDDW site; however, specific sources of the VOCs were not identified. Low concentrations of benzene, ethylbenzene, toluene, and xylenes (BTEX) were associated with the diesel fuel spill. Low levels of chlorinated volatile organics, which are not common components of diesel, were also detected in groundwater samples. The source of the chlorinated compounds was assumed to be from previous solvent handling practices at the site. The JDDW site constituents of concern identified during the RI are listed in Table 2.

RI analytical results were used in a risk assessment to evaluate potential threats to human health and the environment. Results of the risk assessment analysis concluded that waste disposal activities at the site did not represent an unacceptable risk to the public health and environment (Geraghty & Miller, 1990). However, there was potential future exposure of residents located east of the JDDW facility to groundwater containing organic contaminants related to discontinuation of pumping for long periods of time.

4 Remedial Actions

4.1 Remedial Investigation and Feasibility Study

Based on the results of the RI, three remedial action objectives were developed which included:

- Ensure long-term quality of the plant potable water supply
- Continue to prevent offsite migration of the potentially contaminated groundwater.
- Restore groundwater quality in the alluvial aquifer.

The Feasibility Study (FS) report was submitted to the USEPA concurrently with the RI report in August 1988. The purpose of the FS was to identify and evaluate a range of remedial alternatives based on the data collected and the remedial action objectives developed during the RI. The alternatives addressed potential threats to public health,

welfare, and the environment. The USEPA-approved alternatives included the following:

- Installation of an alternative potable water supply for the JDDW facility.
- Continued pumping of plant production wells for onsite containment of potentially impacted groundwater.
- NAPL recovery primarily associated with the diesel line leak.
- Continued groundwater monitoring.

On August 5, 1988, the USEPA published a notice of completion of the FS and the proposed plan for remedial action. A public comment period was established and the public comments were documented in the Administrative Record.

4.2 Record of Decision

The RI and FS resulted in the USEPA selecting a remedy in its Record of Decision (ROD), which was signed by the USEPA Regional Administrator, Region VII on September 29, 1988.

The final RA specified in the ROD includes the following:

1. Developing an alternative potable water supply for the plant,
2. Extracting water from the alluvial aquifer using the existing production wells. This action maintains drawdown around the plant and landfill areas, thus protecting nearby wells and controlling contaminant releases.
3. Continuing to extract and treat NAPL from the alluvial production well PW-3.
4. Using deed restrictions to prevent inappropriate use of the plant property in the future. Future use of the current plant property will be limited to industrial activity only. In addition, water wells tapping the alluvial aquifer beneath the JDDW property would not be allowed.
5. Developing a contingency plan, which would assure that contaminants do not migrate offsite in the event of a plant shutdown.

4.3 Consent Decree and Performance Standards

In September 1989, the USEPA and JDDW entered into a Judicial Consent Decree requiring the development of a Remedial Design (RD) and implementation of Remedial Action (RA). The Performance Standards, an attachment to the Consent Decree, established the guidelines for Remedial Action and the Remedial Action end point. The Consent Decree performance standards and USEPA approved modifications to the performance standards that have occurred since signing the Consent Decree are summarized below:

1. **Develop an alternate water supply for the site**

2. **Continue to extract water from the alluvial aquifer under the Site, at rates which will maintain an inward gradient condition adequate to contain contaminants and prevent migration to private wells offsite.**

   Performance standards for No. 2 are as follows:

   A. Pumpage rate: Simulations performed during the RI/FS estimated that a minimum pumping rate of 1.2 million gallons per day (MGD) would maintain an inward gradient condition adequate to contain the contaminant plume in the alluvial groundwater beneath the site. The Consent Decree required that as part of the RD phase of the work JDDW would review the existing data and further analyze the hydrology beneath the Site to more accurately estimate the minimum pumping rate required to capture the contaminated groundwater flow and prepare a Well Management Plan. The Well Management Plan supersedes the 1.2 MGD guideline in the Consent Decree.

   B. Maintenance and verification of hydraulic gradient: As part of the verification that contaminants are not migrating offsite, a minimum of three piezometer pairs would be utilized near the perimeter of the site. The monitoring well pairs and required water level differences are listed below:

      - South perimeter monitoring well pair MW-1 and MW-20 – water level difference at least 0.10 feet

      - East perimeter monitoring well pair MW-5 (MW-5 was replaced with MW-5N in 1994) and MW-6 - water level difference at least 0.15 feet

- North perimeter monitoring well pair MW-10 and MW-11 - water level difference at least 0.15 feet

The groundwater elevation measured at the outer well of the monitoring well pair should be higher than the groundwater elevation at the inner well of the pair. The Consent Decree specified that the water levels would be measured at least once every four hours. The difference in groundwater levels at each monitoring well pair is calculated on a rolling annual average basis. In July 1997, the USEPA approved reducing the frequency of recording groundwater level measurements from every four hours to monthly.

The Mississippi River stage adjacent to the site would be measured on a normally scheduled working day basis to within 0.1 feet. Although it was not specified in the performance standards, the Little Maquoketa River stage was also measured on a working day basis. In October 2001, the USEPA approved reducing the stage monitoring of the Little Maquoketa River from daily to monthly at the same time as the water levels.

Measure water levels on a monthly basis for the 14 shallow monitoring wells listed in Table 3 and prepare contour maps of water levels in these wells and in the Mississippi and Little Maquoketa Rivers. Water levels are also measured in Production Wells PW-3 (now PW-3A), PW-4 (now PW-4A), PW-5, and PW-7 (now P-7A). After one year, if the water levels in the there perimeter monitoring well pairs indicated a consistent inward gradient, contour maps would be prepared on a quarterly basis for the next two years. Although quarterly contour maps are no longer required, JDDW has continued to prepare water level maps on a quarterly basis.

C. Monitoring performance of the withdrawal well system: The Consent Decree required alluvial production wells PW-3 (now PW-3A), PW-4 (now PW-4A), PW-5, and PW-7 (now P-7A) and the 14 monitoring wells listed in Table 3 to be sampled quarterly for the first year and annually thereafter for the constituents of concern listed in Table 2. In September 1998, the USEPA approved reducing the groundwater monitoring frequency to biennial, eliminating hexavalent chromium, lead, and copper sampling from all wells in the monitoring program, and reducing the number of monitoring wells included in the monitoring program (Table 3).

D. Discharge of surface water from the site: The Consent Decree required JDDW to obtain a revised NPDES permit with the groundwater monitoring constituents included for sampling at Outfalls 002, 005, and 011. Outfalls 002 and 005 discharge non-contact cooling water, drinking fountain water, and storm water through the north and south sedimentation ponds, respectively. These ponds are equipped with oil skimmers. Outfall 011 discharges wastewater from a physical, chemical, and biological treatment plant which treats all process wastewater from the facility (IDNR, 1999).

E. Completion of the work. Alluvial groundwater is required to be extracted and sampled until the constituents of concern are reduced to below the federal Maximum Contaminant Levels (MCLs) or applicable Iowa state groundwater remediation regulations, whichever are more stringent. The State of Iowa has defined the groundwater action level to be the Lifetime Health Advisory Level (HAL) if one exists. If there is no HAL, the action level is the Negligible Risk Level (NRL). It there is no HAL or NRL then the action level is equal to the MCL. For constituents for which there is no MCL or State requirement, the following regulatory sources shall be used in descending order to identify completion levels.

- Proposed MCL
- The USEPA Office of Drinking Water Lifetime Health Advisory Levels
- Integrated Risk Information (IRIS) verified reference dose or 10^{-6} cancer potency factor and ingestion of 2 liters of water per day by a 70 kilogram (kg) adult
- The USEPA Office of Research and Development Health Effect Assessment Criteria

The groundwater extraction will continue until four consecutive quarters of monitoring indicate that the alluvial water quality beneath the Site has been at or below completion levels in effect at that time. In December 1996, the USEPA and IDNR approved the use of federal MCLs for those contaminants with MCLs as cleanup goals instead of the more stringent HALs and NRLs. The current groundwater Performance Standards identified as of April 2003 for the constituents of concern are listed in Table 4.

3. **Develop contingency plans to ensure that contaminants in the alluvial aquifer do no migrate offsite in the event of plant shutdown or modifications which decrease pumpage rates.**

4. **Continue to extract non-aqueous phase liquid ("NAPL") from the alluvium and to separate the NAPL, with the groundwater effluent to be discharged through NPDES outflows and the remaining materials to be transported for offsite management at a permitted RCRA hazardous waste disposal facility, unless Deere demonstrates the alternative disposition measures meet all applicable or relevant and appropriate requirements and USEPA approves such alternative measures.**

Performance standards for No. 4 are as follows:

A. NAPL management: The NAPL management is outlined in Number 4 above.

B. Record keeping: Record volume of NAPL and volume of contaminated water withdrawn on a normal scheduled workweek basis for each recovery well. NAPL thickness is measured quarterly at NAPL recovery wells RW-3 (now RW-3A), RW-4 (now RW-4A), RW-5, and G-2S and the monitoring wells listed in Table 3.

C. Monitoring performance of the NAPL withdrawal system: Alluvial production wells PW-3 (now PW-3A), PW-4 (now PW-4A), PW-5, and PW-7 (now P-7A) and six monitoring wells listed in Table 3 are to be sampled quarterly for the first year and annually thereafter for BTEX and trichlorocthene (TCE). These wells are monitored concurrently with 2(c).

D. Completion of work. NAPL monitoring and recovery operations shall continue until no more than ¼-inch of NAPL is detected and verified in RW-3 (now RW-3A), and no more than 1/8-inch of NAPL is detected and verified in monitoring wells MW-4, MW-6, MW-7S, MW-8S, MW-12, and MW-13S and recovery wells RW-4, RW-5, and G-2S. When 1/4-inch or less of NAPL is detected at RW-3 and/or 1/8-inch or less of NAPL is detected at any other of the above listed wells, the well in question shall be purged of three well volumes and allowed to stabilize for 24 hours before a verification thickness measurement is taken.

Before certifying completion of the NAPL phase of work, the wells listed in the paragraph above will be analyzed for BTEX, TCE, and total petroleum hydrocarbons. If the BTEX and TCE concentrations are below performance standards for four consecutive quarters, the NAPL extraction and treatment requirements are considered complete.

4.4 Remedy Implementation

4.4.1 Remedial Design

The RD was started on February 7, 1989 and the RD report was approved by the USEPA in September 1990. Pursuant to Section IV of the Consent Decree paragraphs 18 and 23, Deere & Company lodged the required deed restriction and a copy of the Consent Decree with the Dubuque County Recorders Office on January 19, 1990. The RD report addressed implementation of the requirements set in the ROD and Consent Decree. The RD report included documentation on the modifications made to the JDDW potable well system and a Groundwater Management Plan.

4.4.1.1 Potable Well System Modifications

Installation of an alternative potable water supply for the JDDW facility was completed in 1988. Prior to 1988, the potable water and plant process water source for the plant included groundwater from the alluvial aquifer. In 1988, JDDW separated the potable water piping from other plant process water piping and connected it solely to bedrock wells PW-1 and PW-2 installed into the lower limestone aquifer. The bedrock aquifer provides higher quality water without the potential for contamination from surficial sources.

4.4.1.2 Groundwater Management Plan

The Groundwater Management Plan included three components: a Well Management Plan, a Groundwater Monitoring Plan, and a NAPL Management Plan. JDDW initiated groundwater monitoring activities required by the Consent Decree in January 1990

The Well Management Plan addressed the containment and recovery of impacted alluvial aquifer groundwater. The Plan was developed from the remedial design modeling results and included alluvial production well system operating guidelines to maintain a minimum total pumping rate necessary to create an inward hydraulic gradient to prevent offsite migration of VOCs. The Well Management Plan indicated that under extreme hydrologic conditions, the optimum minimum total pumping rates

from production wells PW-4 and PW-7 required to maintain the hydraulic head differences in the three perimeter wells are 0.52 MGD and 0.37 MGD, respectively. The total minimum rate of 0.89 MGD is lower than earlier the estimated total pumping rate of 1.2 MGD derived during the RI/FS. The Well Management Plan also provided operating guidelines for contingency activities implemented if the alluvial production system is shutdown or modified. The Well Management Plan supersedes the 1.2 MGD guideline in the Consent Decree.

The Groundwater Monitoring Plan identified groundwater quality sampling and hydraulic monitoring to be completed for the duration of the RA and reporting requirements. The monitoring program provided assurance that the RA would be effective and would prevent offsite migration of potentially contaminated groundwater and restore groundwater quality in the alluvial aquifer. A contingency monitoring program was also included in the Groundwater Monitoring Plan. The NAPL Management Plan presented existing and future NAPL recovery operations and reporting requirements. Table 4 summarizes the monitoring required by the Groundwater and NAPL Management Plans.

4.4.2 Remedial Performance From Implementation in September 1990 to March 1998

The five-year reviews completed in September 1995 and September 1998 concluded that the response actions implemented by JDDW, together with the long-term monitoring, continue to protect the public health, welfare, and the environment at the JDDW site.

During the 1994 to 1998 period, the following modifications were made to the alluvial groundwater recovery system, NAPL recovery system, and groundwater monitoring network after obtaining USEPA's approval:

- JDDW received approval from USEPA in September 1994 to relocate well MW-5 due to construction activities. This well was relocated in the fourth quarter of 1994 and was renamed MW-5N.

- Production wells PW-4 and PW-7 were replaced because water being pumped from these wells contained large volumes of sand. Production well PW-4 was replaced with PW-4A in May 1995 and PW-7 was replaced with PW-7A in September 1995.

- NAPL recovery well RW-4 was also replaced in May 1995 with RW-4A.

- In August 1995, JDDW replaced monitoring well SBW-3 with SBW-3N due to inadvertent covering of SBW-3 with concrete.

- In April 1997, JDDW received approval from the USEPA to relocate Production Well PW-3 and Recovery Well RW-3 due to changes in plant production. The old wells were abandoned on April 21, 1997. The replacement wells were called PW-3A and RW-3A. The replacement well locations are shown on Figure 4.

The following modifications were made to the Consent Decree performance requirements:

- In December 1996, the USEPA and IDNR approved the use of federal MCLs for those contaminants with MCLs as cleanup goals instead of the more stringent HALs and NRLs.

- In July 1997, JDDW received approval from the USEPA to reduce the frequency of recording groundwater level measurements at the perimeter piezometer pairs from every four hours to monthly.

4.4.2.1 Maintain Inward Gradient

During the September 1990 to March 1998 period, the groundwater extraction system continued to be fully operational and functional. Operation of the system created a hydraulic capture zone to contain NAPL. The system met the performance criteria for hydraulic capture of the groundwater with the exception of the final week of 1995 when the pumping rate was 0.82 MGD, below the 0.89 MGD minimum pumping rate specified in the Water Management Plan and the 1.2 MGD guideline specified in the Consent Decree. Despite the reduced pumping rate, monitoring water levels showed that an inward hydraulic gradient had been maintained. Water levels in the three piezometer pairs at the perimeter of the site consistently exhibited rolling annual average head differences greater than the minimum requirements established in the performance standards.

4.4.2.2 Performance of Withdrawal System

Between September 1990 and March 1998, groundwater quality monitoring was performed in accordance with the Consent Decree. Groundwater samples were collected in the required onsite wells listed in Table 3 quarterly in 1990 and annually thereafter. The tetrachlorethene (PCE) concentrations detected in MW-6, MW-9S,

MW-13S, and SBW-3; the TCE concentrations detected in MW-6, MW-9S, MW-13S, MW-16, PW-4, and SBW-3; and the benzene concentrations detected in MW-13S, PW-3 and PW-5 have been above performance standards as shown in the summary of analytical data presented in Appendix B. Chromium concentrations exceeded the standard in MW-11S during one Quarter, February 1990.

Figures 4, 5, and 6 illustrate trends in concentrations of PCE, TCE, and benzene, respectively, from September 1990 to March 1998. Between 1990 and July 1997, TCE, benzene, and PCE concentrations showed a general decline, with the exception of TCE and PCE peaks observed in 1993 and a benzene peak observed in 1991. In 1997, increases in concentrations of PCE and TCE were detected in MW-9S and benzene in MW-13S. These concentration increases correspond to the relocation of production well PW-3A.

4.4.2.3 NAPL Recovery

NAPL recovery occurred in Wells G-2S, RW-4, and RW-3 from November 1980 to July 1991. During this time, 138,163 gallons of NAPL were recovered. No measurable amounts of NAPL were recovered from January 1991 through July 1991, although 3.67 million gallons of groundwater were pumped from RW-3 during this time.

NAPL recovery operations were discontinued in July 1991; however the recovery wells and monitoring wells listed in Table 3 have continuously been monitored for NAPL thickness as required by the Consent Decree.

Until January 1998, less than ¼-inch of NAPL had been measured at RW-3 since recovery operations ceased. As a result of relocating PW-3 and RW-3, approximately 4.6 inches of NAPL was detected in new recovery well RW-3A in January 1998. Lab analysis shows the material is consistent with No. 6 fuel oil. The NAPL was removed in three days. Twenty-hours after removal, the NAPL was measured at a thickness less than 1/8-inch. Measurements in April 1998 showed a thickness of 0.01 feet (less than 1/8-inch), and during the Five-Year Review site visit in May 1998, NAPL was measured at a thickness of 0.02 feet (1/4 inch).

4.4.2.4 Discharge of Surface Water from Site

JDDW has 18 NPDES permitted outfalls with various monitoring requirements and discharge limits, which are listed in the NPDES permit presented in Appendix C. Surface water discharge through the NPDES permitted outfalls to the Mississippi River

and the Little Maquoketa River are monitored and reported in monthly wastewater monitoring reports in accordance with the NPDES Permit for the JDDW facility. Only Outfalls 002, 005, and 011 were identified by the Consent Decree for monitoring discharges for the constituents of concern.

The March 5, 1991 NPDES permit amendment required that Outfalls 002 and 005 be monitored monthly for copper and quarterly for total toxic organic (TTO) pollutants. The permit established copper limits for Outfall 002 (0.071 milligrams per liter [mg/L], 0.39 pounds per day [lbs/day]) and Outfall 005 (0.04 mg/L and 3.004 lbs/day). Additionally, the effluent limitations for metal finishing, which include copper, lead and hexavalent chromium, and TTO pollutants were added for Outfall 011 (Table 5). Outfalls 002 and 005 were analyzed for copper and TTO pollutants in July 1992. The TTO pollutant list is comprised of the JDDW site constituents of concern (Table 2). Copper levels identified in Outfalls 002 (0.01 mg/L, 0.07 lbs/day) and 005 (0.01 mg/L, 0.35 lbs/day) in July 1992 did not exceed established effluent limitations (USEPA, 1995). The TTO constituents identified in Outfalls 002 (0.042 mg/L, 0.277 lbs/day) and 005 (0.041 mg/L, 1.269 lbs/day) were all BTEX compounds (USEPA, 1995).

A revised NPDES permit was issued by IDNR for the JDDW facility on September 3, 1992. The final effluent from Outfall 011 was required to be analyzed once every six months for TTO pollutants. The TTO effluent limit for Outfall 011 is listed on Table 5. The inorganic constituents of concern, lead, copper and hexavalent chromium, were required to be analyzed two times a week. The IDNR did not consider it necessary to continue to monitor Outfalls 002 or 005 for copper and TTO pollutants. Amendments to the September 3, 1992 NPDES permit were issued on January 21, 1994 and August 14, 1995. The effluent limitations set for lead, copper and hexavalent chromium at Outfall 011 in the September 3, 1992 NPDES Permit and in the August 14, 1995 revision to the permit are listed in Table 5. The revised permit expired on September 1, 1997 and at IDNR's direction, JDDW continued operating under this permit until a new permit was issued on July 15, 1999.

Outfalls 002 and 005 are regularly monitored for flow rate, oil and grease, pH, and temperature. Effluent limitations and monitoring requirements for these parameters are set in the NPDES permit. Between September 1990 and March 1998, none of the parameters monitored in Outfall 005 exceeded the effluent limitations. Beginning in February 1994, Outfall 002 was also monitored for total residual chlorine in accordance with a January 21, 1994 amendment to the NPDES Permit, which took effect August 1, 1994. During the September 1990 to March 1998 period, all concentrations of lead, copper, and hexavalent chromium detected at Outfall 011 were below the permitted discharge limits, except for four days in April 1995 when

hexavalent chromium exceeded the effluent limitation and one day in July 1994 when lead exceeded the effluent limitation. None of the organic constituents of concern were detected at Outfall 011 during this period. Outfall 011 is also regularly monitored for flow rate, biochemical oxygen demand (BOD5), total suspended solids, pH, temperature, cadmium, total chromium, cyanide, nickel, lead, oil and grease, silver, and zinc. Total chromium exceeded effluent limitations three days in April 1995 and BOD5 exceeded effluent limitations one day in November 1992 and one day in October 1993. All other constituents monitored at Outfall 011 did not exceed the effluent limitations set in the NPDES permit.

4.4.3 Systems Operations/Operation and Maintenance

Since the alluvial aquifer groundwater recovery system at the JDDW site is the plant production well system, the costs associated with maintaining the system are included in the plant's operating budget. Operation and maintenance (O&M) costs for the RA include costs for hydraulic and groundwater quality monitoring, administrative services and reporting, and the alternate water supply. Since these costs were not compiled in the previous Five-Year Review Report and cannot be used to indicate potential remedy problems, these costs were not included in this five-year review report.

5 Progress Since Last Review

5.1.1 Protectiveness Statement

The September 1998 Five-Year Review stated that the groundwater extraction system continues to be fully operational and functional. Operation of the system creates a hydraulic capture zone that contains and withdraws the contaminated groundwater. All progress reports submitted to date indicate an inward hydraulic gradient has been maintained. The response actions implemented by JDDW, together with the long-term monitoring, continue to protect the public health, welfare, and environment.

5.1.2 Recommendations and Status of Follow-up Actions

Recommendations from the last five-year review were that JDDW continue to monitor and maintain the hydraulic gradient; monitor the presence of NAPL and perform NAPL recovery as necessary; and to monitor the surface water and groundwater. JDDW requested during the Second Five-Year Review to reduce the number of wells in the monitoring program and to abandon wells not detailed in the Consent Decree. The USEPA recommended that the number of wells in the monitoring program be

reduced, the sampling frequency be changed to every two years, and that the wells not detailed in the Consent Decree be abandoned.

Groundwater Monitoring Program

The USEPA recommended that the following wells be removed from the monitoring program: MW-7S, MW-7D, MW-11S, MW-11D, MW-16, MW-20S, MW-20D, and SBW-3N. These wells had not had contaminant exceedences (inorganic or organic) in Performance Standards in the five previous years. The removal of the wells was conditional on the maintenance of the inward hydraulic gradient and no changes in the groundwater withdrawal program. If the gradient or the withdrawal program changes, the USEPA reserved the right to include these wells in future sampling programs. Water levels would continue to be taken in accordance with the Consent Decree.

Although JDDW requested that MW-8S, MW-9D, MW-12, and MW-13D be removed from the monitoring program, USEPA stated that since production well PW-3 had been relocated, continued monitoring in the area of PW-3 and PW-3A is warranted until the full effect of the relocation has been determined. JDDW has continued to include these wells in the groundwater monitoring program.

USEPA also recommended that lead, chromium, and copper analyses be eliminated from all wells in the monitoring program. These analytes had not been detected above MCLs since the inception of the RA and did not warrant additional monitoring. Beginning in 2000, these parameters were eliminated from the groundwater sampling program.

Groundwater Monitoring Frequency

The USEPA recommended that JDDW complete the groundwater sampling event scheduled for 1998. If the data collected from 1998 was comparable to 1997, the USEPA recommended that monitoring be reduced to every two years. Since the groundwater data collected in 1998 was comparable to 1997, the frequency of monitoring was reduced to every two years beginning in 1998.

Well Abandonment

The USEPA recommended abandoning the following wells: SBW-2, SBW-4, SBW-5; peizometers PZ-1-86, PZ-2-86, PZ-3-86, PZ-4-86, PZ-5-86, PZ-6-86, PZ-8-86, PZ-9-86, PZ-10-86; and wells MW-3, MW-7D, MW-8D, MW-14, MW-15, MW-17, and MW-19D. These wells were not in the current monitoring program outlined in the Consent Decree (Table 3). Abandonment of these wells would not impact the effectiveness of the remedy. These wells, except SBW-4, were abandoned in May 1999 in accordance with IDNR requirements. JDDW provided USEPA with a record of the well abandonment in the Second Quarterly Report of 1999.

Soil boring well SBW-4 was not abandoned in May 1999 because 0.11 feet of NAPL was detected in this monitoring well during the well sounding step conducted May 24, 1999 prior to abandonment activities. On May 25, 1999, an absorbent sock was installed in SBW-4. The absorbent sock was removed and checked on May 26, 1999 and approximately 4 ounces of NAPL was removed from the well. After the sock was removed, the well was checked for the presence of NAPL and none was detected. SBW-4 was checked again for NAPL during the week of May 31, 1999 and no NAPL was detected. SWB-4 was monitored periodically in June 1999 and once in July 1999. Each monitoring event indicated that NAPL was not present.

6 Third Five-Year Review Findings

The third five-year review team includes William Gresham of USEPA, George Hellert of JDDW, and Pedro Fierro and Kathy Thalman of ARCADIS. The five-year review includes community notification, document review, interviews with plant personnel, a site inspection, review of applicable or relevant and appropriate requirements (ARARs), and monitoring data evaluation.

6.1 Community Notification and Involvement

The community was notified by the USEPA on February 8, 2003 in the Telegraph Herald and via mail that the five-year review was being conducted. After the five-year review is completed, the results of the review will be provided to the local site repository.

6.2 Document Review

The following documents were reviewed during the third five-year review:

- USEPA Record of Decision (USEPA, 1988)
- Consent Decree (USEPA, 1989)
- Final Remedial Design Report (Geraghty & Miller, 1990)
- September 1995 Five-Year Review Report (USEPA, 1995)
- September 1998 Five-Year Review Report (CDM, 1998)
- Quarterly Long Term Monitoring Reports from the second quarter of 1998 through the first quarter of 2003 (ARCADIS Geraghty & Miller, 1998-2002)
- The September 12, 1992 revised NPDES permit for the JDDW site, January 21, 1994 and August 14, 1995 amendments to the September 3, 1992, and the July 15, 1999 NPDES permit (IDNR)
- Monthly NPDES Reports for JDDW site (JDDW April 1998-March 2003)
- The documents in the local site repository were reviewed on August 7, 2003 to evaluate record keeping. The documents present at the Carnegie-Stout Public Library in Dubuque are listed in Appendix A.

The following ARARs documents were reviewed:

- Federal Clean Water Act/Safe Drinking Water Act (Federal Maximum Contaminant Levels)
- The USEPA Office of Drinking Water Lifetime Health Advisory Levels
- Integrated Risk Information System (IRIS) verified reference dose or 10^{-6} cancer potency factor and ingestion of 2 liters of water per day by a 70 kilogram adult
- The USEPA Office of Research and Development Health Effects Assessment Criteria
- Iowa state groundwater remediation regulations (Iowa Environmental Protection Commission, Chapter 133, "Rules for Determining Cleanup Actions and Responsible Parties")

A detailed document list is presented in Appendix A.

6.3 Data Review

Data reviewed during the five-year review included groundwater withdrawal amounts, water level data, groundwater quality data, NAPL recovery, and surface water discharge data collected between April 1998 and March 2003. This data was compared to the site Performance Standards specified in the Consent Decree.

6.3.1 Groundwater Withdrawal

The volume of groundwater pumped out of production wells has exceeded the 0.89 MGD minimum pumping rate specified in the Water Management Plan and the 1.2 MGD guideline specified in the Consent Decree except during the weeks of December 28, 1999, November 6, 13, and 20, 2000 and December 3, 2000 when the daily pumping rates were 0.91, 0.85, 0.81, 0.78, and 0.72 MGD, respectively. Table 6 presents a summary of the well pumping rates. Water levels in the three piezometer pairs at the perimeter of the site have consistently exhibited rolling annual average head differences greater than the minimum requirements established in the Consent Decree Performance Standards. A summary of the rolling head differences at each of the three piezometer pairs is provided in Table 7.

6.3.2 Surface Water

The JDDW facility has 18 NPDES-permitted outfalls with various monitoring requirements and discharge limits, which are listed on the NPDES permits (Appendix C). Surface water discharge through the NPDES permitted outfalls to the Mississippi River and the Little Maquoketa River has been monitored and reported in monthly wastewater monitoring reports in accordance with the NPDES Permit for the JDDW facility. The site constituents of concern are monitored in Outfall 011 as specified by the Consent Decree.

As discussed previously, a revised NPDES permit was issued by IDNR for the JDDW facility on September 3, 1992, which was amended on January 21, 1994 and August 14, 1995. The revised permit expired on September 1, 1997 and at IDNR's direction, JDDW continued operating under this permit until a new permit was issued on July 15, 1999. The new permit expires on July 14, 2004. The following modifications were made in the July 15, 1999 NPDES permit:

- The hexavalent chromium monitoring requirement was removed for Outfall 011 in the July 1999 NPDES permit. (Note: The source of hexavalent chromium at JDDW was eliminated when the chrome electroplating operation was discontinued in October 1994. The electroplating equipment was physically removed from the site in January 1996.)

- The monitoring frequency for cadmium, total chromium, copper, lead, nickel and zinc at Outfall 011 was reduced from twice a week to quarterly.

- The temperature effluent limits were eliminated for Outfalls 002, 005, and 011.

The August 14, 1995 amendment of the September 3, 1992 NPDES permit and July 15, 1999 NPDES permit are included as Appendix C. The NPDES effluent Outfall 011 limitations for the constituents of concern and sampling frequency are listed in Table 5.

Surface water discharge through the NPDES permitted outfalls to the Mississippi River and the Little Maquoketa River have been monitored and reported in monthly wastewater monitoring reports to IDNR in accordance with the August 14, 1995 amendment of the September 3, 1992 NPDES permit and July 15, 1999 NPDES permit for the JDDW facility (JDDW April 1998-March 2003).

Outfalls 002 and 005 are regularly monitored for flow rate, oil and grease, pH and temperature. Outfall 002 is also monitored for total residual chlorine. Effluent limitations and monitoring requirements for these parameters are set in the NPDES permit in effect at the time of the monitoring. The temperature effluent limit was eliminated in the July 15, 1999 NPDES permit.

None of the parameters monitored at Outfall 005 have exceeded the effluent limitations set forth in the September 1992 and July 1999 NPDES permits during the past five years. At Outfall 002, the monthly average flow rate exceeded the effluent limitations in May, June and July 2002 and the daily maximum total residual chlorine effluent limitation was slightly exceeded during one week in May 1999.

In accordance with the NPDES permit, the final effluent from Outfall 011 was analyzed once every six months for TTOs. The inorganic constituents of concern, lead copper, and hexavalent chromium, were analyzed two times per week between April 1990 and June 1999 and two times a month between July 1999 and September 2000. Beginning in October 1999, the frequency of metals sampling was decreased to once every three months.

In Outfall 011, concentrations of lead, copper and hexavalent chromium (April 1998 to July 1999) were identified at levels below the permitted discharge limits (Table 8). Outfall 011 was analyzed for TTO in April and October of 1998, 1999, 2000, 2001, and 2002. The wastewater monitoring reports reviewed from April 1998 to March 2003 indicate the TTO concentrations were below effluent limitations. Chloroform was the only constituent of concern detected during the five-year review period.

Outfall 011 is also regularly monitored for flow rate, BOD5, total suspended solids, pH, temperature, cadmium, total chromium, cyanide, nickel, lead, oil and grease, silver and zinc. None of these constituents exceeded effluent limitations during the five-year review period except for the daily maximum flow rate in March 2001

6.3.3 NAPL

NAPL operations were discontinued on July 21, 1991; however, NAPL thickness has been continuously monitored quarterly at the well locations listed in Table 3. In January of 1998, NAPL was measured at 4.6 inches in Recovery Well RW-3A and NAPL recovery operations were performed. Subsequent to the recovery operations, NAPL was recorded in RW-3A during the second (0.01 ft), third (0.48 ft), and fourth (0.21) quarters of 1998 (Table 9). NAPL has been absent from RW-3A since January 1999. With the exception of RW-3A and MW-6 in July 2000, NAPL has only been measured up to 0.02 feet (approximately ¼ inch) in MW-20S, RW-4A, and MW-9S (Table 9).

NAPL was detected at a thickness of a trace to 0.02 feet in MW-9S in July 2002. The MW-9S dedicated pump motor would not operate on June 18, 2002 when the biannual groundwater sampling event was conducted. The MW-9S pump was removed and inspected and it was determined that the source of the NAPL was the dedicated pump's motor. The motor's casing had deteriorated to a point where the motor leaked some of its own oil into the well. The NAPL was removed from MW-9S using absorbent material and NAPL was not detected in the well during subsequent monitoring events.

Soil boring well SBW-4 was not abandoned in May 1999 because 0.11 feet of NAPL was detected in this monitoring well during the well sounding step conducted on May 24, 1999 prior to abandonment activities. On May 25, 1999, an absorbent sock was installed in SBW-4. The absorbent sock was removed and checked on May 26, 1999 and approximately 4 ounces of NAPL was removed from the well. After the sock was removed, the well was checked for the presence of NAPL and none was detected. SBW-4 was checked again for NAPL during the week of May 31, 1999 and no NAPL was detected. SWB-4 was monitored periodically in June 1999 and once in July 1999.

Each monitoring event indicated that NAPL was not present. SBW-4 was monitored for NAPL on September 23, 2003 and NAPL was detected. JDDW will develop and submit a plan to EPA detailing the monitoring program that will be implemented at SBW-4 for NAPL monitoring.

6.3.4 Groundwater Quality

In July 1998, groundwater samples were collected from eighteen wells specified in the Consent Decree including four alluvial production wells (PW-3A, PW-4A, PW-5 and PW-7A), eight paired monitoring wells (MW-9S and MW-9D, MW-11S and MW-11D, MW-13S and MW-13D, and MW-20S and MW-20D), and six monitoring wells (SBW-3N, MW-6, MW-7S, MW-8S, MW-12, and MW-16) (Table 3). Since the groundwater data collected in 1998 was comparable to the 1997 data, the frequency of monitoring was reduced to every two years beginning in 1998 as approved in the September 1998 Five-year Review Report. Additionally, lead, copper, and hexavalent chromium were eliminated from all monitoring wells sampled and the wells included in the biannual groundwater sampling events was reduced to MW-6, MW-8S, MW-9D, MW-9S, MW-12, MW-13D, MW-13S and alluvial production well PW-3A, PW-4A, PW-5, and PW-7A and (Table 3).

Monitoring well MW-9D was not sampled during the 2000 and 2002 biannual events because an obstruction, located approximately 25 feet below ground surface, prohibited the introduction of any variety of submersible pump into that portion of the well which lies below water. The complete refusal of the sampling pump to go past the obstruction in 2000 indicated that the well had continued to deteriorate with time, as it was possible to sample in July of 1998, although with some difficulty. In the 2000 Third Quarter Long-term Monitoring Report, JDDW recommended abandoning MW-9D because the physical state of the well inhibited its usefulness as a monitoring well. JDDW also recommended that a new replacement well for MW-9D not be installed because water quality had been demonstrated to meet cleanup criteria and the well was no longer in a critical location to meet the objectives of the ROD. In correspondence dated June 18, 2002, the USEPA approved abandoning monitoring well MW-9D in place. USEPA also approved the recommendation not to replace MW-9D by stating that it is apparent that there are enough other monitoring well locations at which to gather data and at this point in time the cessation of sampling at MW-9D does not represent a critical loss of meaningful data, especially since this location hasn't demonstrated contamination above MCLs. Monitoring well MW-9D was abandoned on August 22, 2002 in accordance with IDNR requirements by a licensed well contractor.

A summary of the analytical data is presented in Appendix B. Wells that have contaminants of concern above federal MCLs are listed in Table 8. Contaminants that have been above MCLs during the last five years of monitoring include PCE, TCE, and benzene.

Figure 4, 5, and 6 illustrate the trends in concentrations of PCE, TCE, and benzene in the alluvial aquifer from 1990 to 2003. Between 1990 and July 1997, TCE, benzene, and PCE concentrations showed a general decline, with the exception of TCE and PCE peaks observed in 1993 and a benzene peak observed in 1991. In 1997, the concentrations of PCE and TCE detected in MW-9S, which had been below USEPA MCLs during the 1994, 1995, and 1996 sampling events, increased to above USEPA MCLs (Figures 4 and 5). The increase in concentrations probably is the result of the relocation of PW-3, which occurred in April 1997. During subsequent sampling events, the concentrations of PCE and TCE detected in MW-9S decreased. The TCE concentrations detected in MW-9S decreased to below the MCL in 1998 and the PCE concentrations decreased to below the MCL in 2002.

The benzene concentrations detected in MW-13S have been above the MCL (5.0 micrograms per liter [µg/L]) since 1997 (Figure 6, Appendix B). Between 1990 and 1997, the benzene concentrations exceeded the MCL only during one sampling event (September 1992). The concentrations of benzene detected in MW-13S began to increase after production well PW-3 was replaced with PW-3A, which occurred in 1996. It appears that the relocation of PW-3A has modified the groundwater flow path in the vicinity of MW-13S, resulting in residual benzene associated with the NAPL being drawn into the monitoring well. The concentrations of benzene detected in MW-13S increased from 19 ug/L in August 2000 to 130 ug/L in June 2002.

Benzene concentrations detected in PW-5 were above the MCL during the 2000 groundwater sampling event. Benzene has only been detected in PW-5 in three of the groundwater sampling events (Appendix B).

6.4 Site Inspection

On August 7, 2003, George Hellert of JDDW, and Kathy Thalman of ARCADIS conducted the site inspection to evaluate components of the remediation with respect to the Consent Decree and Decision Documents. The Site Inspection Check List is presented in Appendix D. The purpose of the inspection was to assess the protectiveness of the remedy including the presence of fencing to restrict site access and the condition of the site monitoring wells.

No significant issues were identified during the site inspection. Production wells, NAPL recovery wells, and monitoring wells at the JDDW site were in good condition. The site fence is in good condition. The institutional controls that are in place include prohibitions of inappropriate use of the plant property in the future. Future use of the current plant property is limited to industrial activity only. In addition, wells tapping the alluvial aquifer beneath the JDDW property for the purpose of extracting water for human drinking purposes or for irrigation of food or feed crops are not allowed. No activities were observed that violate the institutional controls.

The documents in the local site repository, the Carnegie-Stout Public Library, were reviewed on August 7, 2003 to evaluate record keeping. The documents present at the Carnegie-Stout Public Library in Dubuque are listed in Appendix A. The documents were easily accessible and in good condition.

6.5 Interviews

Interviews were conducted with George Hellert and Kevin Braun of JDDW on August 7, 2003. The interview documentation form and interview records are presented in Appendix D. George Hellert indicated that there had been no complaints from residents living adjacent to JDDW.

Since 1997, JDDW has been in the process of reducing the size of the facility by closing down and demolishing buildings. As a result of the process reduction, the amount of water required to operate the facility has decreased. During previous years, JDDW has needed to pump significantly more process water than the Well Management Plan required to insure that groundwater containment was achieved. With the process change, JDDW plans to reduce the water withdrawal from the alluvial aquifer to amounts that may approach the minimum requirements of the Well Management Plan. The reduction in groundwater withdrawal will optimize the use of the production wells and reduce JDDW's operating costs. In March and April 2003, the JDDW groundwater model was updated to incorporate the replacement and relocation of production wells PW-3A, PW-4A, and PW-7A. The updated groundwater model was then used to update the Well Management Plan to insure that the minimum water withdrawal requirements were accurate for the current production well configuration. The April 9, 2003, ARCADIS memorandum that summarizes the modifications made to the existing model as well as the revisions to the Well Management Plan is included in Appendix D. Using the updated Well Management Plan, JDDW determined that they could use three production wells to provide water for the plant and meet the environmental requirements. JDDW decided to use production

wells PW-3A, PW-4A, and PW-7A. The pump from PW-4A was placed in PW-3A and the PW-5 pump was placed in PW-4A. PW-5 will be retained as a backup well.

Kevin Braun indicated that JDDW is meeting plant production requirements without PW-5 and the plant water production is above environmental requirements. If JDDW approaches a place where the Superfund requirements drive the water production, the water production rate will be watched carefully and the Well Management Plan will be used to determine pumping rates required to maintain an inward gradient

7 Technical Assessment

Question A: Is the remedy functioning as intended by the decision documents?

YES:

The review of the documents, ARARs, risk assumptions, and the results of the site inspection indicate that the remedy is functioning as intended by the ROD. The JDDW groundwater extraction system is fully operational and functional. Operation of the system creates a hydraulic capture zone that contains and withdraws the contaminated groundwater. All progress reports submitted to date indicate that an inward hydraulic gradient has been maintained. During the 2002 groundwater sampling event, concentrations of constituents of concern were below USEPA MCLs in all wells included in the groundwater monitoring program except MW-13S. The TTO, hexavalent chromium, lead and copper concentrations detected in Outfall 011 did not exceed NDPES effluent limits.

Since 1997, JDDW has been in the process of reducing the size of the facility by closing down and demolishing buildings. As a result of the process changes, the amount of water required to operate the facility has decreased. During previous years, JDDW has needed to pump significantly more process water than the Well Management Plan required to insure that groundwater containment was achieved. With the process change, JDDW plans to reduce the water withdrawal from the alluvial aquifer to amounts that may approach the minimum requirements of the Well Management Plan. The reduction in groundwater withdrawal will optimize the use of the production wells and reduce JDDW's operating costs. In March and April 2003, the JDDW groundwater model was updated to incorporate the replacement and relocation of production wells PW-3A, PW-4A, and PW-7A. The updated groundwater model was then used to update the Well Management Plan to insure that the minimum water withdrawal requirements were accurate for the current production well configuration. Using the updated Well Management Plan, JDDW determined that

they could use three production wells to provide water for the plant and meet the environmental requirements. JDDW decided to use production wells PW-3A, PW-4A, and PW-7A. The pump from PW-4A was placed in PW-3A and the PW-5 pump was placed in PW-4A. PW-5 will be retained as a backup well.

Institutional controls for the JDDW site include a deed restriction that requires future use of the plant property be limited to industrial activity and does not allow installation of potable water wells in the alluvial aquifer beneath the JDWW property. No activities were observed that violate the institutional control.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?

YES:

This five-year review includes a review of newly promulgated requirements of Federal and State environmental laws. The ROD identified federal MCLs and Iowa's Groundwater Protection Policy as ARARs to be attained in the extraction of contaminated groundwater.

The Consent Decree Performance Standards require that alluvial groundwater be extracted and sampled until the constituents of concern are reduced to below the federal MCLs or applicable Iowa state groundwater remediation regulations, whichever are more stringent. The State of Iowa (Chapter 133. "Rules for Determining Cleanup Actions and Responsible Parties" Section 133.4(3)b.2) has defined the groundwater action level to be the Lifetime HAL if one exists. If there is no HAL, the action level is the NRL. It there is no HAL or NRL then the action level is equal to the MCL. For constituents for which there is no MCL or State requirement, the following regulatory sources shall be used in descending order to identify completion levels.

- Proposed MCL
- The USEPA Office of Drinking Water Lifetime Health Advisory Levels
- IRIS verified reference dose or 10^{-6} cancer potency factor and ingestion of 2 liters of water per day by a 70 kg adult

- The USEPA Office of Research and Development Health Effect Assessment Criteria

The groundwater extraction will continue until four consecutive quarters of monitoring indicate that the alluvial water quality beneath the Site has been at or below completion levels in effect at that time or if JDDW demonstrates to the USEPA that contaminant concentrations are below background levels.

In October 1995, JDDW requested that the IDNR allow the use of MCLs as cleanup goals rather than the HALs and NRLs. The IDNR along with the USEPA approved the use of MCLs in December 1996. This change in ARARs did not affect the protectiveness of the current remedy at the JDDW site.

During the April 1998 to March 2003 period, a revised USEPA MCL was promulgated for total trihalomethanes, which is used as the USEPA MCL for chloroform (Table 10). The IRIS reference dose for hexavalent chromium changed from 5.0×10^{-3} milligrams per kilogram a day (mg/kg –day) to 3.0×10^{-3} mg/kg-day, which changed the calculated performance standard to 110 ug/L (Table 10). Table 5 lists the current performance standards for the JDDW site. These changes in ARARs did not affect the protectiveness of the current remedy at the JDDW site.

There have been no changes in the physical condition of the site and in land use near the site that would affect the protectiveness remedy.

There have been no changes in the toxicity factors for the contaminants of concern that were used in the baseline risk assessment. Standard risk assessment methodologies have not changed in a way that could affect the protectiveness of the remedy. The remedy is progressing as expected.

Question C: Has any other information come to light that could call into question the protectiveness of this remedy.

There is no additional information that calls into question the protectiveness of the remedy.

Technical Assessment Summary

According to the data reviewed, the site inspection, and the interviews, the remedy is functioning as intended by the ROD. There have been no changes in the physical conditions of the site that would affect the protectiveness of the remedy. There have

been no changes in the toxicity factors for the contaminants of concern that were used in the baseline risk assessment. Standard risk assessment methodologies have not changed in a way that could affect the protectiveness of the remedy. There is no additional information that calls into question the protectiveness of the remedy.

8 Issues

No issues were found during the five-year review.

9 Recommendations and Required Actions

Recommendations based on this third five-year review include the following: JDDW should continue to monitor and maintain the hydraulic gradient; monitor the presence of NAPL and perform NAPL recovery as necessary; and monitor the surface water and groundwater.

JDDW requests that USEPA approve abandoning monitor well MW-13D. MW-13D has not had contaminant exceedences (inorganic or organic) in Performance Standards since 1990 (Appendix B). Relative to SBW-4, EPA approved abandoning SBW-4 during the second five year review; however, the abandonment of this well was delayed because NAPL was detected in the well. JDDW will develop and submit to EPA a plan detailing the monitoring program that will be implemented. Additionally, JDDW requests that USEPA approve reducing the river stage monitoring of the Mississippi River to monthly at the same time as the monitor well water levels since this data is only used in the development of site water table maps.

10 Protectiveness Statement

The selected remedy remains protective of human health and the environment and complies with Federal and State requirements that are applicable or relevant and appropriate to this remedial action. Therefore, this remedy continues to be protective to human health and the environment.

11 Next Review

The fourth five-year review should be conducted by September 15, 2008.

Tables

TABLE 1
CHRONOLOGY OF SITE EVENTS
John Deere Dubuque Works
Dubuque, Iowa

Date	Event
August 1, 1980	Discovery
July1,1983	Preliminary Assessment Report Issued
July 1 to September 1, 1983	Site Inspection
December 18, 1984	Hazard Ranking System (HRS) Package
September 18, 1985	The USEPA Proposed the JDDW site for inclusion on the NPL.
September 30, 1986	The USEPA and JDDW enter into an Administrative Order on Consent requiring the development of a Remedial Investigation and Feasibility Study (RI/FS) for the site.
June 24, 1998	The USEPA proposes removing the JDDW site as a candidate for inclusion in the NPL; however, the USEPA determined that JDDW should continue with remedial activities as required by the USEPA for compliance with CERCLA.
August 3, 1988	JDDW Submitted the RI/FS Report to the USEPA
August 5, 1988	The USEPA published a notice of completion for the RI/FS and the proposed plan for remediation. A public comment period was established and public comments were documented in the administrative record.
September 29, 1988	The ROD was signed by the USEPA summarizing the USEPA's decisions for site remediation. This is also the date of the completion of the RI/FS.
December 18, 1989	The USEPA and JDDW enter into a Judicial Consent Decree requiring the development of a Remedial Design (RD) Report and Remedial Action (RA).
January 1990	JDDW initiated groundwater monitoring activities according to the Consent Decree. Quarterly RA reports were prepared and submitted the USEPA.
February 7, 1989	Remedial design start
January 19, 1990	JDDW lodged required deed restriction with Dubuque County Records office.
September 1990	The Final RD Report was submitted to and approved by USEPA. This date marks the start of the RA activities
1994	MW-5 was replaced with MW-5N in the 4th Quarter of 1994
May 1995	JDDW replaced PW-4 with PW-4A due to large volumes of sand in the water pumped from the well.
August 10, 1995	JDDW replaced SBW-3 with SBW-3N because of an inadvertent concrete pour over SBW-3.
September 18, 1995	JDDW replaced PW-7 with PW-7A due to large volumes of sand in the water pumped from the well.

TABLE 1
CHRONOLOGY OF SITE EVENTS
John Deere Dubuque Works
Dubuque, Iowa

Date	Event
September 22, 1995	Completion of the initial Five-Year Review
July 1996	The USEPA approved reducing the frequency of water level measurements in wells from once every four hours of operation to once monthly.
December 1996	The USEPA approved the use of Federal MCLs at JDDW instead of the more stringent NRLs and HALs.
December 1996	JDDW requested to abandon Wells G2S and G2D
April 1997	The USEPA approved the relocation of Well PW-3 to PW-3A
September 30, 1998	Completion of the second Five-Year Review
July 1997	Frequency of groundwater level measurements in perimeter wells was reduced from every four hours to monthly.
September 30, 1998	USEPA approved abandonment of selected monitoring wells after an entire round of groundwater sampling; the groundwater sampling frequency be changed to biannually, and the elimination of lead, chromium, and copper analyses from all wells in the monitoring program.
May 1999	Historical soil boring wells SBW-2, SBW-5; piezometers PZ-1-86, PZ-2-82, PZ-3-86, PZ-4-86, PZ-5-86, PZ-6-86, PZ-8-86, PZ-9-86, PZ-10-86; monitoring wells MW-3, MW-7D, MW-8D, MW-14, MW-15, MW-17 and MW-19D were abandoned
October 25, 2001	USEPA approved reducing the stage monitoring the Little Maquoketa River from daily to monthly at the same time as water levels
June 18, 2002	USEPA approved abandonment of MW-9D
August 22, 2002	MW-9D was abandoned

TABLE 2
CONSTITUENTS OF CONCERN
John Deere Dubuque Works
Dubuqe, Iowa

Constituents
Benzene
Carbon Tetrachloride
Chloroform
Hexavalent Chromium
Copper
1,1-Dichloroethane
1,1-Dichloroethene
1,2-Dichloroethene (total)
Ethylbenzene
Lead
1,1,2,2-Tetracloroethane
Tetrachloroethene
Toluene
1,1,1-Trichloroethane
1,1,2-Trichloroethane
Trichloroethene
Xylenes

TABLE 3

SUMMARY OF GROUNDWATER WITHDRAWAL SYSTEM AND NAPL MONITORING

John Deere Dubuque Works

Dubuque, Iowa

	Groundwater Withdrawal System Monitoring				NAPL Recovery Monitoring			
Well Name	Hydraulic Water Level	Inward hydraulic Gradient Wells	Consent Decree Quality	Quality Revised 1998[2/]	Volume	Quality	Compliance	Notes
Monitoring Wells								
MW-1	X	Paired with MW-20					X [1/]	
MW-2								
MW-3								Abandoned in 5/99.
MW-4							X	
MW-5/ MW-5N	X	Paired with MW-6					X [1/]	MW-5 was replaced with MW-5N in the 4th Quarter of 1994
MW-6	X	Paired with MW-5	X	X		X	X	
MW-7S	X		X			X	X	The 8/98 Five-Year Review Report approved removing this well from the monitoring program- USEPA reserves the right to include this well in future sampling programs. See a/
MW-7D								Abandoned 5/99
MW-8S	X		X	X		X	X	
MW-8D								Abandoned 5/99
MW-9S	X		X	X			X [1/]	
MW-9D			X	X				Obstruction at 25 ft bls prohibited introduction of any variety of pump into well - JD proposed to abandon this monitor well in the July through September 2000 Quarterly Report (page 6), Abandoned in 8/02
MW-10	X	Paired with MW-11					X [1/]	
MW-11S	X	Paired with MW-10	X				X [1/]	The 8/98 Five-Year Review Report approved removing this well from the monitoring program- USEPA reserves the right to include this well in future sampling programs. See a/
MW-11D			X					The 8/98 Five-Year Review Report approved removing this well from the monitoring program- USEPA reserves the right to include this well in future sampling programs. See a/
MW-12			X	X		X	X	
MW-13D			X	X				
MW-13S	X		X	X		X	X	
MW-14								Abandoned 5/99
MW-15								Abandoned 5/99

TABLE 3

SUMMARY OF GROUNDWATER WITHDRAWAL SYSTEM AND NAPL MONITORING

John Deere Dubuque Works

Dubuque, Iowa

	Groundwater Withdrawal System Monitoring				NAPL Recovery Monitoring			
Well Name	Hydraulic Water Level	Inward hydraulic Gradient Wells	Consent Decree Quality	Quality Revised 1998[2/]	Volume	Quality	Compliance	Notes
MW-16			X				X [1/]	The 8/98 Five-Year Review Report approved removing this well from the monitoring program- USEPA reserves the right to include this well in future sampling programs. See a/
MW-17								Abandoned 5/99
MW-18	X							
MW-19S	X							
MW-19D								Abandoned 5/99
MW-20S	X	Paired with MW-1	X				X [1/]	The 8/98 Five-Year Review Report approved removing this well from the monitoring program- USEPA reserves the right to include this well in future sampling programs. See a/
MW-20D			X					The 8/98 Five-Year Review Report approved removing this well from the monitoring program- USEPA reserves the right to include this well in future sampling programs. See a/
X-17	X							
PZ-1-86								Abandoned 5/99
PZ-2-86								Abandoned 5/99
PZ-3-86								Abandoned 5/99
PZ-4-86								Abandoned 5/99
PZ-5-86								Abandoned 5/99
PZ-6-86								Abandoned 5/99
PZ-7-86	X							
PZ-8-86								Abandoned 5/99
PZ-9-86								Abandoned 5/99
PZ-10-86								Abandoned 5/99
SBW-2								Abandoned 5/99
SBW-3								In 8/10/95 SBW-3 was replaced with SBW-3N because concrete poured over SBW-3
SBW-3/ SBW-3N			X			X	X [1/]	In 8/10/95 SBW-3 was replaced with SBW-3N because concrete poured over SBW-3. The 8/98 Five-Year Review Report approved removing this well from the monitoring program- USEPA reserves the right to include this well in future sampling programs. See a/
SBW-4								This well was supposed to be abandoned in 5/99 but NAPL found in well
SBW-5								Abandoned 5/99

TABLE 3

SUMMARY OF GROUNDWATER WITHDRAWAL SYSTEM AND NAPL MONITORING

John Deere Dubuque Works

Dubuque, Iowa

Well Name	Groundwater Withdrawal System Monitoring				NAPL Recovery Monitoring			Notes
	Hydraulic Water Level	Inward hydraulic Gradient Wells	Consent Decree Quality	Quality Revised 1998[2/]	Volume	Quality	Compliance	
Production Wells								
PW-1								
PW-2								
PW-3/ PW-3A	X		X	X		X		April 1997 EPA approved relocation of PW-3 to PW-3A. PW-3 was abandoned in April 12, 1997.
PW-4/ PW-4A	X		X	X		X		In May 1995, PW-4 was replaced with PW-4A because large volumes of sand in the water pumped from the well
PW-5	X		X	X		X		
PW-6								
PW-7/ PW-7A	X		X	X		X		In September 1995, PW-7 replaced with PW-7A due to large volumes of sand in the water pumped from the well
PW-8								
NAPL Recovery Wells								
RW-3/ RW-3A					X		X	April 1997 EPA approved relocation of RW-3 to RW-3A, RW-3 was abandoned on April 12, 1997, NAPL recovery was discontinued in July 1991
RW-4/ RW-4A					X		X	In May 1995 RW-4 was replaced with RW-4A the same time as PW-4 was replaced with PW-4A, NAPL recovery was discontinued in July 1991
RW-5					X		X	NAPL recovery was discontinued in July 1991
G-2S					X		X	NAPL recovery was discontinued in July 1991, JDDW requested to abandon in Dec 1996
G-2D								JDDW requested to abandon in Dec 1996

a/ The removal of this well was conditional on the maintenance of the inward hydraulic gradient and no changes in the groundwater withdrawal program. If the gradient or the withdrawal program changes, the USEPA reserves the right to include these well in future sampling programs.

1/ These wells were not included in the Consent Decree

2/ The reduction in the number of wells required for quality monitoring was approved by USEPA in the September 1998 Second Five-Year Review Report.

TABLE 4
CURRENT PERFORMANCE STANDARDS FOR CONTAMINANTS IN GROUNDWATER
John Deere Dubuque Works
Dubuque, Iowa

Analytes	Federal MCL (ug/L)	IRIS (ug/L)	HEAST (ug/L)
Benzene	5		
Carbon Tetrachloride	5		
Chloroform	80 [2/]		
Hexavalent Chromium		110 (a)	990 (b)
Copper	1300 [1/]		
1,1-Dichloroethane	-	-	
1,1-Dichloroethene	7		
1,2-Dichloroethene (total)	70		
Ethylbenzene	700		
Lead	15 [1/]		
1,1,2,2-Tetracloroethane	-	0.089 (c)	
Tetrachloroethene	5		
Toluene	1,000		
1,1,1-Tricloroethane	200		
1,1,2-Trichloroethane	5		
Trichloroethene	5		
Xylenes	10,000		

Footnotes:

- = Indicates that no level has been established.

[1/] = The criteria for lead and copper are action levels, not MCLs.

[2/] = MCL for Trihalomethanes (total)

(a) = The Performance Standard Calculations for Chromium (VI) are found in Appendix F.

(b) = The Performance Standard Calculations for 1,1-dicloroethane are found in Appendix F.

(c) = The Performance Standard Calculations for 1,1,2,2-tetrachlorethane are found in Appendix F.

MCL = Maximum Contaminant Level (May 1995).

IRIS = Integrated Risk Information System, 1994.

HEAST = Health Effects Assessment Summary Tables, March 1994.

Sources: U.S. EPA Office of Water 1996
U.S. EPA 1991b, 1994a, 1994b,
IDNR 1994

TABLE 5

NPDES EFFLUENT LIMITATIONS FOR THE CONSTITUENTS OF CONCERN IN OUTFALL 011.

John Deere Dubuque Works

Dubuque, Iowa

Constituent	Monitoring Frequency	Effluent Limitation			
		Daily Maximum		30 Day Average	
		Concentration mg/L	Mass lbs/day	Concentration mg/L	Mass lbs/day
January 26, 1987 NPDES Permit - March 5, 1991 Ammendment					
Lead	2/week	0.69	2.00	0.43	1.26
Copper	2/week	0.94	2.73	0.63	1.83
Chromium (VI)	2/week	0.41	1.20	0.27	0.82
Total Toxic Organics*	1/3 months	2.13	6.00	NEL	NEL
September 3, 1992 NPDES Permit					
Lead	2/week	0.69	2.00	0.43	1.26
Copper	2/week	0.94	2.73	0.63	1.83
Chromium (VI)	2/week	0.41	1.20	0.27	0.82
Total Toxic Organics*	1/6 months	2.13	6.00	NEL	NEL
September 3, 1992 NPDES Permit - August 15, 1995 Amendment					
Lead	2/week	0.69	2.00	0.43	1.26
Copper	2/week	0.81	2.70	0.54	1..80
Chromium (VI)	2/week	1.00	3.40	0.67	2.30
Total Toxic Organics*	1/6 months	2.13	6.00	NEL	NEL
July 15, 1999 NPDES Permit					
Lead	1/3 months	0.69	2	0.43	1.26
Copper	1/3 months	0.81	2.70	0.54	1..80
Chromium (VI)	NEL	NEL	NEL	NEL	NEL
Total Toxic Organics*	1/6 months	2.13	NEL	NEL	NEL

Footnotes:

* Total Toxic Organics include benzene, carbon tetrachloride, chloroform, 1,1-dichloroethane, 1,1-dichloroethene, trans-1,2-dichloroethene, ethylbenzene, 1,1,2,2-tetrachloroethane, tetrachloroethene, toluene, 1,1,1-trichloroethane, 1,1,2-trichloroethane, trichloroethene, xylenes.

NEL - No effluent limitation

mg/L - Milligrams per liter

lbs/day - Pounds per day

TABLE 6
ALLUVIAL PRODCITON WELL PUMPING SUMMARY
John Deere Dubuque Works
Dubuque, Iowa

Period		Alluvial Aquifer Pumping (MGD)		
Year	Quarter	Minimum	Maximum	Average
1998	2	2.45	4.78	3.30
	3	3.08	4.56	3.91
	4	2.20	3.27	2.61
1999	1*	0.91	2.46	2.13
	2	2.27	4.27	3.21
	3	1.44	4.24	2.62
	4	2.01	2.98	2.46
2000	1	1.61	2.80	2.27
	2	2.19	3.84	3.21
	3	2.03	4.22	3.39
	4*	0.72	2.79	1.61
2001	1	2.00	2.30	2.12
	2	2.36	3.72	2.95
	3	2.34	7.09	3.53
	4	1.56	2.79	2.26
2002	1	1.31	2.09	1.92
	2	2.22	3.75	2.89
	3	2.06	3.60	2.78
	4	1.44	2.15	1.65
2003	1	1.37	1.80	1.57

MGD = Millions of Gallons per Day
Alluvial wells include Production Wells PW-3A, PW-4A, PW-5 and PW-7A.
* Below pumping rate suggested in Consent Decree (1.2 MGD) and
below minimum pumping rates set in the Well Management Plan

TABLE 7
PAIRED WELL HEAD DIFFERENCE SUMMARY
John Deere Dubuque Works
Dubuque, Iowa

	Annual Average Head Difference (feet)*					
	MW-10 & MW-11S		MW-5N and MW-6		MW-1 & MW-20S	
Year	Actual	Required	Actual	Required	Actual	Required
1998	1.00	0.15	0.56	0.15	0.51	0.10
1999	1.14	0.15	0.50	0.15	0.51	0.10
2000	0.92	0.15	0.58	0.15	0.45	0.10
2001	0.78	0.15	0.65	0.15	0.40	0.10
2002	0.63	0.15	0.58	0.15	0.51	0.10
**2003	0.58	0.15	0.56	0.15	0.56	0.10

* Numbers represent the annual average of the difference between the outer and inner well pair. A positive value indicates that the potentiometric surface slopes toward the main facility.

** Includes first quarter only.

Source: ARCADIS, April 2003

TABLE 8
CHEMICAL GROUNDWATER ANALYSES SUMMARY
John Deere Dubuque Works
Dubuque, Iowa

Tetrachloroethene (MCL = 5 ug/L)			
Well	1998 (3)	2000 (3)	2002 (2)
MW-9S	17	7.2	0.5
Trichloroethene (MCL = 5 ug/L)			
Well	1998 (3)	2000 (3)	2002 (2)
MW-6	1.7	6.3	3.5
Benzene (MCL = 5 ug/L)			
Well	1998 (3)	2000 (3)	2002 (2)
MW-13S	15	19	130 J
PW-5	<0.50	7.6	1.1

Sources of the groundwater data are the quarterly reports submitted by JDDW to USEPA.

( ) = Quarter in which data was collected.
J = Estimated by laboratory due to value below lower calibration limit or positive result has been classified as qualitative during data validation
ug/L = Micrograms per liter
MCL = Maximum Contaminant Level
NOTE: Only those wells which have contaminants detected above the MCLs have been included in this table. All data is listed for a well location if at least one sample contained concentrations above MCLs.

TABLE 9
NON-AQUEOUS PHASE LIQUID (NAPL) MONITORING RESULTS
John Deere Dubuque Works
Dubuque, Iowa

Monitoring Location	1998			1999				2000			
	4/17/98	7/14/98	10/15/98	1/21/99	4/14/99	7/16/99	10/19/99	1/18/00	4/18/00	7/18/00	10/17/00
MW-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-5N	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-6	ND	ND	0.01	0.32	0.02	0.02	0.02	0.02	0.01	0.03	ND
MW-7S	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-8S	ND	ND	ND	ND	ND	ND	0.01	ND	ND	ND	ND
MW-9S	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-11S	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-12	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-13S	ND	ND	ND	ND	ND	ND	ND	ND	0.01	ND	ND
MW-16	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-20S	ND	ND	ND	ND	ND	ND	ND	ND	0.02	ND	ND
SBW-3N	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
G-2S	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
RW-3A	0.01	0.48	0.21	ND	ND	ND	ND	ND	ND	ND	ND
MW-3A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
RW-4A	ND	ND	ND	ND	ND	ND	ND	0.01	ND	<0.01	ND
RW-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

ND = NAPL was not detected in well.

TABLE 9
NON-AQUEOUS PHASE LIQUID (NAPL) MONITORING RESULTS
John Deere Dubuque Works
Dubuque, Iowa

Monitoring	2001				2002				2003
Location	1/16/01	4/19/01	7/20/01	10/16/01	1/15/02	4/16/02	7/18/02	10/15/02	1/15/03
MW-1	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-4	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-5N	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-6	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-7S	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-8S	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-9S	ND	ND	ND	ND	ND	ND	Trace - 0.02	ND	ND
MW-10	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-11S	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-12	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-13S	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-16	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-20S	ND	ND	ND	ND	ND	ND	ND	ND	ND
SBW-3N	ND	ND	ND	ND	ND	ND	ND	ND	ND
G-2S	ND	ND	ND	ND	ND	ND	ND	ND	ND
RW-3A	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-3A	ND	ND	ND	ND	ND	ND	ND	ND	ND
RW-4A	ND	ND	ND	ND	ND	ND	ND	ND	ND
RW-5	ND	ND	ND	ND	ND	ND	ND	ND	ND

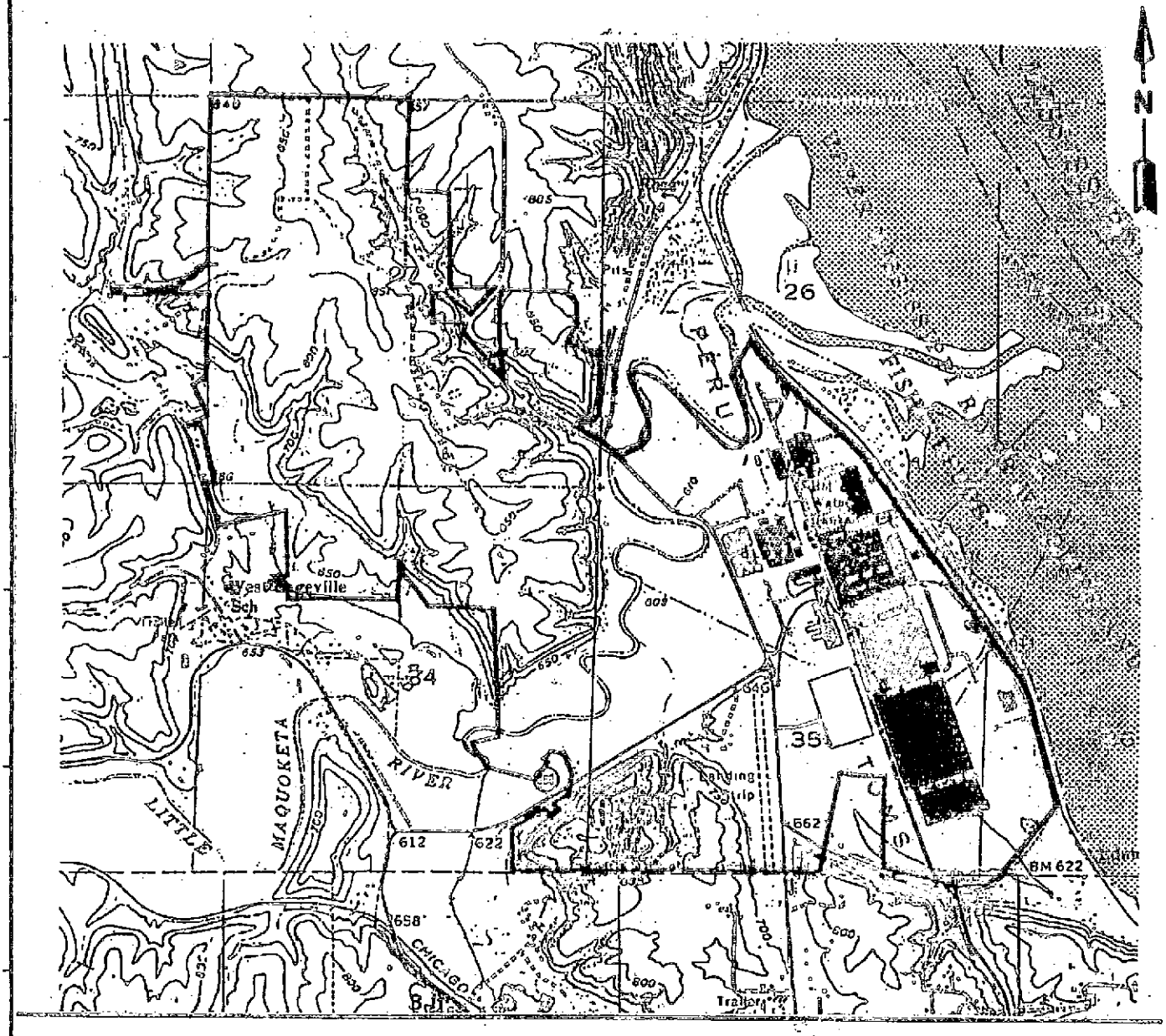
ND = NAPL was not detected in well.

TABLE 10
Changes in Chemical-Specific Standards
John Deere Dubuque Works
Dubuque, Iowa

Contaminant	Media	Cleanup Level	Standard		Citation/Year
Total Trihalomethanes	Groundwater	80 µg/L	Previous	100 µg/L	http://www.epa.gov/safewater/mcl.html
			New	80 µg/L	40 CFR 141.64.
Hexavalent Chromium	Groundwater	110 µg/L	Previous	182 µg/L	Calculated value using toxicity data
			New	110 µg/L	from IRIS (2003).

IRIS - Integrated risk information system (http://epa.gov/iris/)

Figures



0 2000'
SCALE

LEGEND:

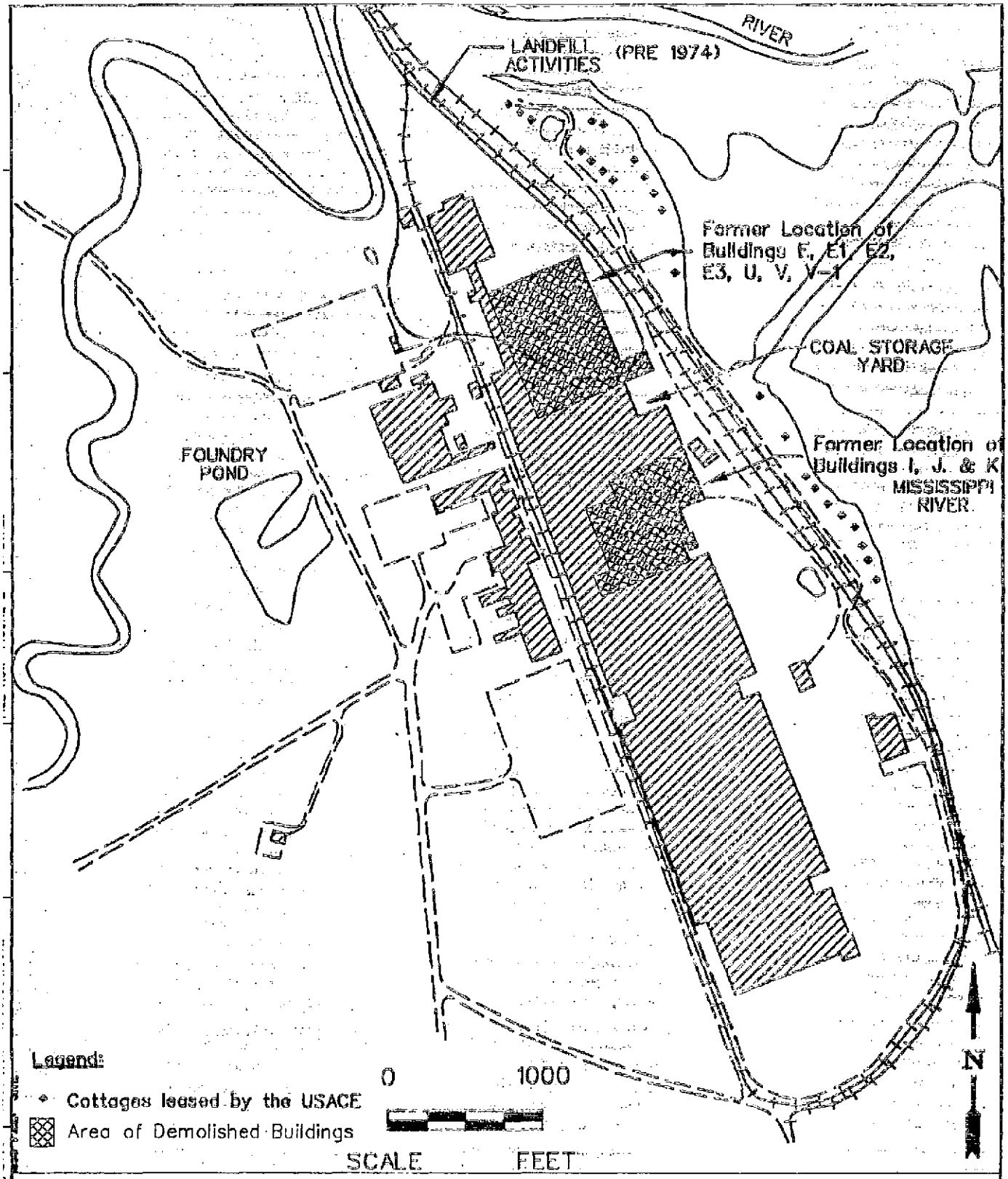
- FEATURES MAPPED IN 1956
- FEATURES MAPPED IN 1972
- FEATURES MAPPED AFTER 1978
- PROPERTY BOUNDARY

ARCADIS
3503 Northdale Boulevard, Suite 120
Tampa, Florida 33624
Tel: 813/961-1921 Fax 813/961-2599

SITE VICINITY MAP

JOHN DEERE DUBUQUE WORKS
DUBUQUE, IOWA

FIGURE
1



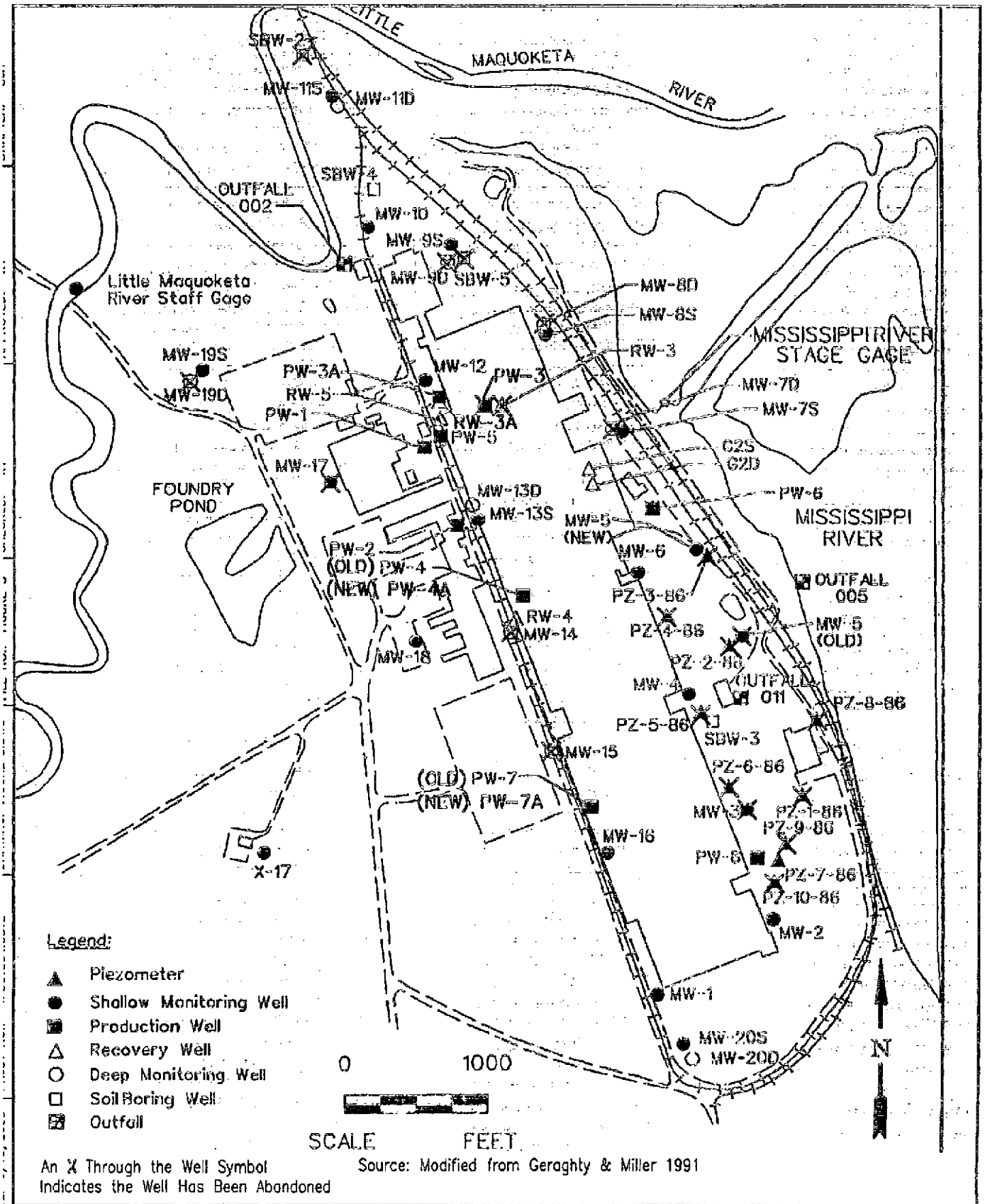
Source: Modified from Geraghty & Miller 1991

ARCADIS
3903 Northdale Boulevard, Suite 120
Tampa, Florida 33624
Tel: 813/961-1921 Fax: 813/961-2599

SITE MAP

JOHN DEERE DUBUQUE WORKS
DUBUQUE, IOWA

FIGURE
2



An X Through the Well Symbol Indicates the Well Has Been Abandoned

Source: Modified from Geraghty & Miller 1991

ARCADIS

3903 Northdale Boulevard, Suite 120
Tampa, Florida 33624
Tel: 813/961-1921 Fax: 813/961-2599

WELL LOCATION MAP

JOHN DEERE DUBUQUE WORKS
DUBUQUE, IOWA

FIGURE 3

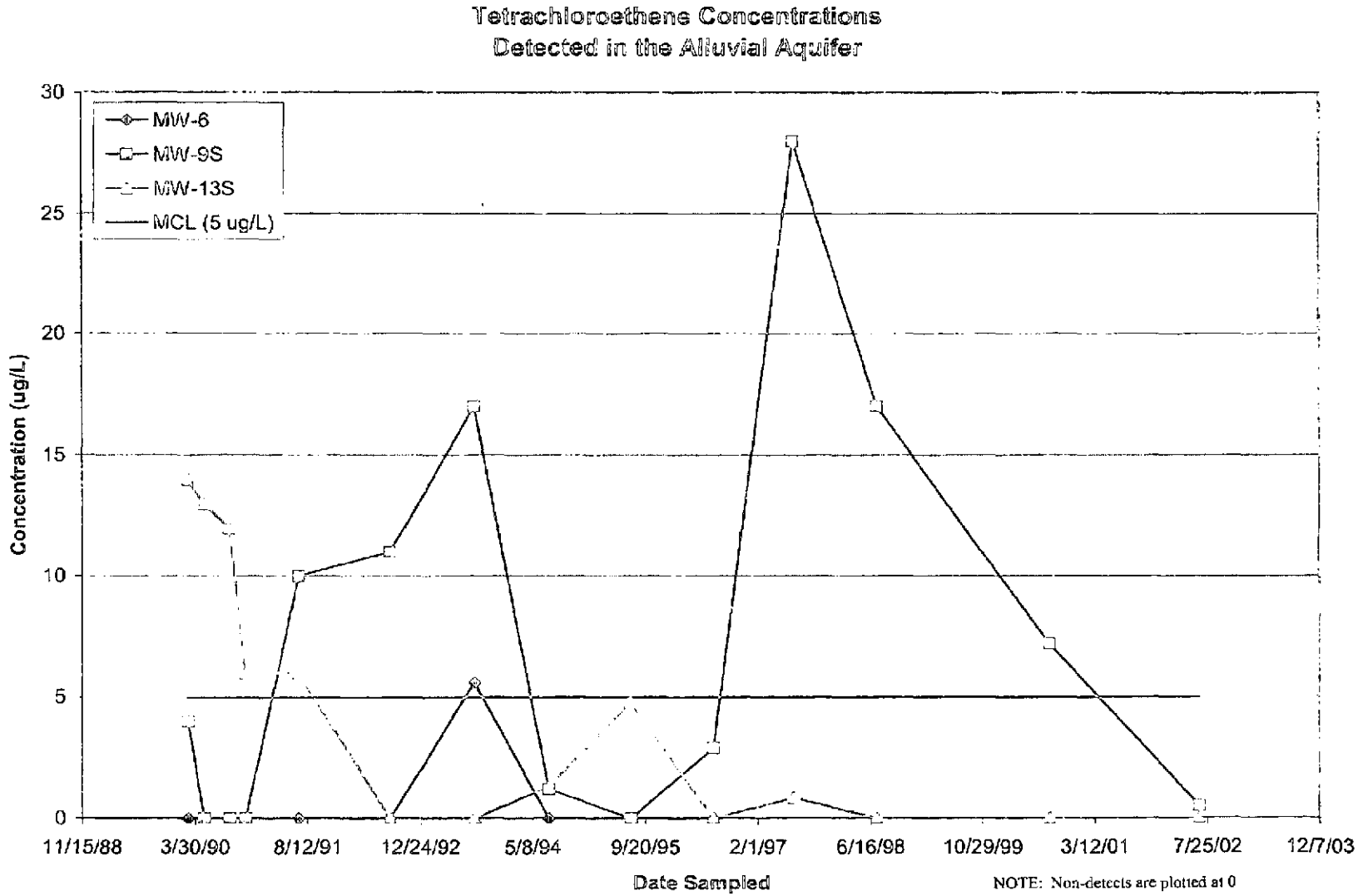


Figure 4. Tetrachloroethene Concentrations Detected in the Alluvial Aquifer, John Deere Dubuque Works, Dubuque, Iowa

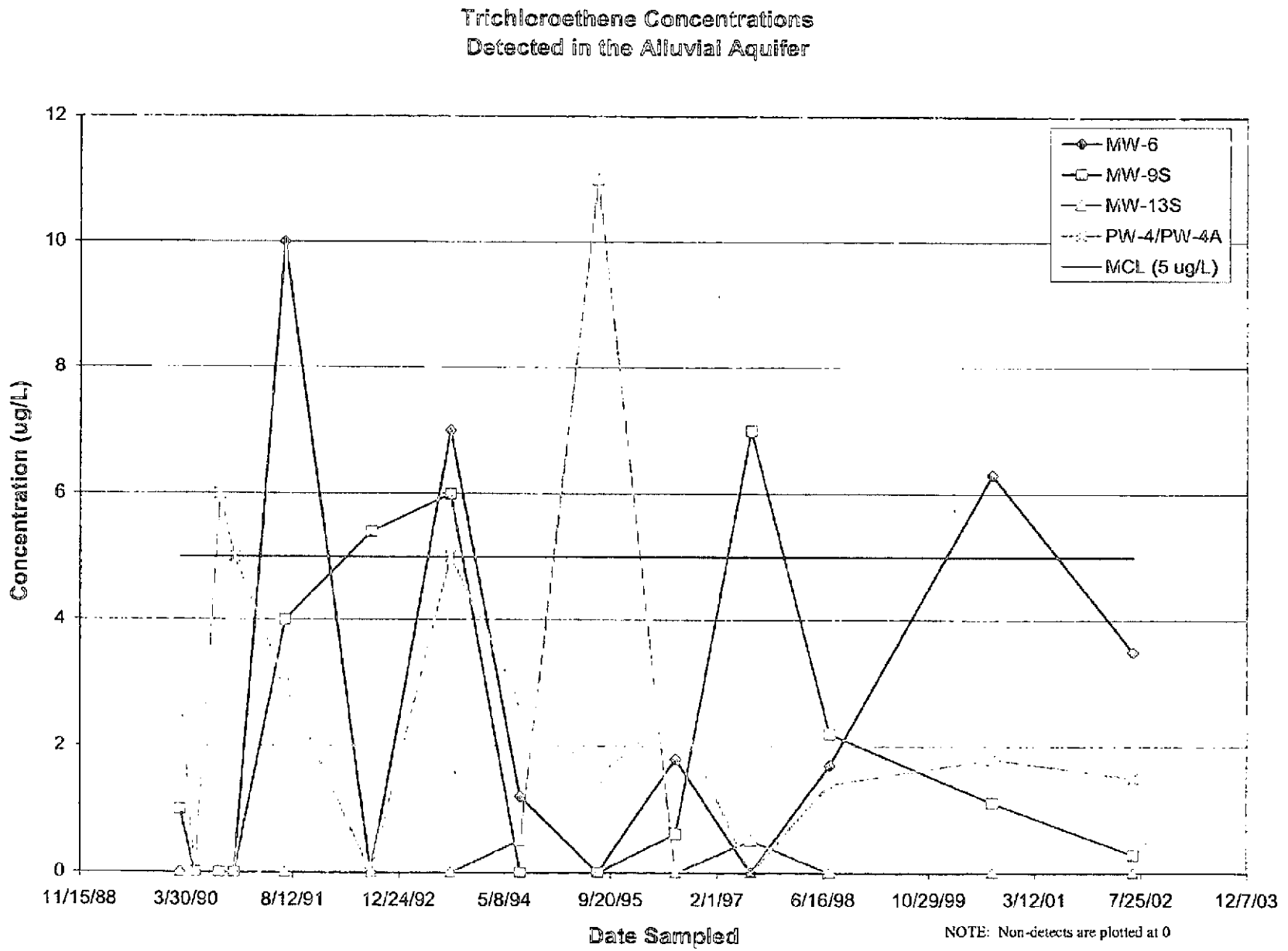


Figure 5. Trichloroethene Concentrations Detected in the Alluvial Aquifer, John Deere Dubuque Works, Dubuque, Iowa

ARCADIS

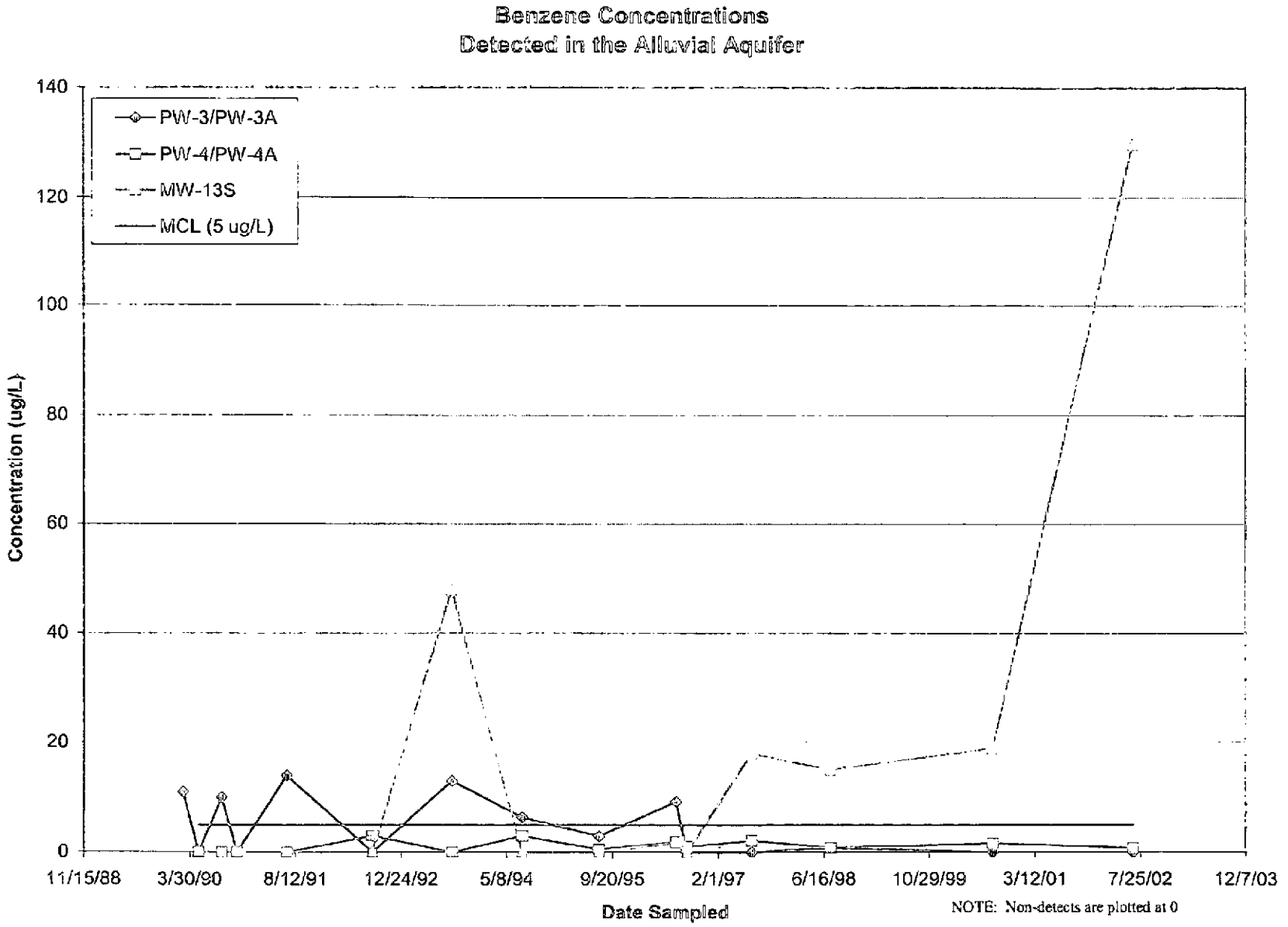


Figure 6. Benzene Concentrations Detected in the Alluvial Aquifer, John Deere Dubuque Works, Dubuque, Iowa

ARCADIS

Appendix A

Documents Reviewed

DOCUMENTS REVIEWED

Reports

ARCADIS G&M, Inc., 2003, 2003 First Quarter Long-Term Monitoring Report John Deere Dubuque Works, Final Report, April 2003.

ARCADIS G&M, Inc., 2002, 2002 Fourth Quarter Long-Term Monitoring Report John Deere Dubuque Works, Final Report, January 2003.

ARCADIS G&M, Inc., 2002, 2002 Third Quarter Long-Term Monitoring Report John Deere Dubuque Works, Final Report, October 2002.

ARCADIS G&M, Inc., 2002, 2002 Second Quarter Long-Term Monitoring Report John Deere Dubuque Works, Final Report, July 2002.

ARCADIS G&M, Inc., 2002, 2002 First Quarter Long-Term Monitoring Report John Deere Dubuque Works, Final Report, April 2002.

ARCADIS G&M, Inc., 2001, 2001 Fourth Quarter Long-Term Monitoring Report John Deere Dubuque Works, Final Report, January 2002.

ARCADIS G&M, Inc., 2001, 2001 Third Quarter Long-Term Monitoring Report John Deere Dubuque Works, Final Report, October 2001.

ARCADIS G&M, Inc., 2001, 2001 Second Quarter Long-Term Monitoring Report John Deere Dubuque Works, Final Report, July 2001.

ARCADIS Geraghty & Miller, Inc., 2001, 2001 First Quarter Long-Term Monitoring Report John Deere Dubuque Works, Final Report, April 2001.

ARCADIS Geraghty & Miller, Inc., 2000, 2000 Fourth Quarter Long-Term Monitoring Report John Deere Dubuque Works, Final Report, January 2001.

ARCADIS Geraghty & Miller, Inc., 2000, 2000 Third Quarter Long-Term Monitoring Report John Deere Dubuque Works, Final Report, October 2000.

ARCADIS Geraghty & Miller, Inc., 2000, 2000 Second Quarter Long-Term Monitoring Report John Deere Dubuque Works, Final Report, July 2000.

ARCADIS Geraghty & Miller, Inc., 2000, 2000 First Quarter Long-Term Monitoring Report John Deere Dubuque Works, Final Report, April 2000.

ARCADIS Geraghty & Miller, Inc., 1999, 1999 Fourth Quarter Long-Term Monitoring Report John Deere Dubuque Works, Final Report, January 2000.

ARCADIS Geraghty & Miller, Inc., 1999, 1999 Third Quarter Long-Term Monitoring Report John Deere Dubuque Works, Final Report, October 1999.

ARCADIS Geraghty & Miller, Inc., 1999, 1999 Second Quarter Long-Term Monitoring Report John Deere Dubuque Works, Final Report, July 1999.

ARCADIS Geraghty & Miller, Inc., 1999, 1999 First Quarter Long-Term Monitoring Report John Deere Dubuque Works, Final Report, April 1999.

ARCADIS Geraghty & Miller, Inc., 1998, 1998 Fourth Quarter Long-Term Monitoring Report John Deere Dubuque Works, Final Report, January 1999.

CDM Federal Programs Corporation, 1998. Second Five-Year Review Report for John Deere Dubuque Works, Dubuque, Iowa, August 1998.

Geraghty & Miller, Inc., 1998, 1998 Third Quarter Long-Term Monitoring Report John Deere Dubuque Works, Final Report, October 1998.

Geraghty & Miller, Inc., 1998, 1998 Second Quarter Long-Term Monitoring Report John Deere Dubuque Works, Final Report, July 1998.

Geraghty & Miller, Inc., 1990, Final Remedial Design Report, September 1990

Unites States Environment Protection Agency, 1991, Comprehensive Five-Year Review Guidance, Office of Emergency and Remedial Response, EPA 540-R-01-007, June 2001

United States Environmental Protection Agency, 1995, Five-Year Review Report, John Deere Dubuque Works, Dubuque, Iowa, September 1995

NPDES Records

Iowa Department of Natural Resources National Pollutant Discharge Elimination System (NPDES) Permit for John Deere Dubuque Works, Iowa NPDES Permit Number 31-26-1-07, Date of Issuance: July 15, 1999, Date of Expiration: July 14, 2004.

Iowa Department of Natural Resources National Pollutant Discharge Elimination System NPDES Permit for John Deere Dubuque Works, Iowa NPDES Permit Number 31-26-1-07, Date of Issuance: September 3, 1992, Date of Expiration: September 1, 1997, Date of this Amendment: August 14, 1995.

Iowa Department of Natural Resources National Pollutant Discharge Elimination System NPDES Permit for John Deere Dubuque Works, Iowa NPDES Permit Number 31-26-1-07, Date of Issuance: September 3, 1992, Date of Expiration: September 1, 1997.

April 1998 through March 2003 John Deere Dubuque Works, Wastewater Monitoring Reports, Facility #31-26-1-07, April 1998 to March 2003

State of Iowa Department of Natural Resources Environmental Program Amendment to NPDES Permit for John Deere Dubuque Works, Iowa NPDES Permit Number 31-26-1-07, Date of Issuance: January 26, 1987, Date of Expiration: September 1, 1991, Date of this Amendment: March 5, 1991.

ARARs

40 CFR 141.80; Subpart I, Control of Lead and Copper.
40 CFR 141.64; Subpart G, Maximum Contaminant Levels for Disinfection By Products
U.S. EPA Office of Water 2003 (http://www.epa.gov/safewater/mcl.html).
USEPA Maximum Contaminant Level standards as of June 2003 http://www.epa.gov/safewater/mcl.html).
IRIS = Integrated Risk Information System, 2003 (http://www,epa.gov/iris).
HEAST = Health Effects Assessment Summary Tables, July, 1997.

Site Repository Documents - Carnegie-Stout Public Library, Dubuque, Iowa – August 7, 2003

Geraghty & Miller, Inc., 1988, Remedial Investigation, John Deere Dubuque Works, Dubuque, Iowa, Final Draft, August 1, 1988. Volumes 1 through 14.

G&M Consulting Engineers, Inc, 1988, Feasibility Study, Final Draft Report prepared for John Deere Dubuque Works, Dubuque, Iowa, August 1988.

United States Army Corps of Engineers Rock Island District, 1986, Environmental Assessment for Real Estate Action, Proposed Long-term Strategy for Maintenance Dredging at John Deere Dubuque Works, Dubuque County, Iowa, April 1986.

United States Environmental Protection Agency, 1995, John Deere Dubuque Works, Dubuque, Iowa, Superfund Site, Administrative Record Addendum, October 1995, Region VII, Superfund Division, USEPA – Five Year Review Report, John Deere Dubuque Works, Dubuque, Iowa, September 1995 conducted by USEPA Region VII, Kansas City, KS.

United States Environmental Protection Agency, 1988, Record of Decision, John Deere Dubuque Works Company Superfund Site, Dubuque, Iowa, USEPA Region VII, Kansas City, Kansas, September 29, 1988.

United States Environmental Protection Agency, Administrative Record, Closure Hazardous Waste Storage Tank and Storage Area, John Deere Dubuque Works, USEPA ID No. IAD005269527, Public Notice 3/8/89 – 4/7/89

United States Environmental Protection Agency, John Deere Dubuque Works Superfund Site, Dubuque, Iowa, 1988, Administrative Record Index, August 1988

John Deere Dubuque Works, Dubuque, Iowa, Superfund Site, Administrative Record, File 1/4 Containing Documents Dated From January 1, 1912 to April 27, 1984

John Deere Dubuque Works, Dubuque, Iowa, Superfund Site, Administrative Record, File 2/4 Containing Documents Dated From May 11, 1984 to April 1, 1986

John Deere Dubuque Works, Dubuque, Iowa, Superfund Site, Administrative Record, File 3/4 Containing Documents Dated From April 9,1986 to May 14, 1987

John Deere Dubuque Works, Dubuque, Iowa, Superfund Site, Administrative Record, File 4/4 Containing Documents Dated From April 15, 1987 to June 30, 1988

Appendix B

Summary of Groundwater Analytical Data

APPENDIX B. GROUNDWATER QUALITY RESULTS SUMMARY, MONITORING WELLS AND PRODUCTION WELLS
1990-2002
JOHN DEERE DUBUQUE WORKS, DUBUQUE, IOWA

Source or Location	Sample Collection Date	Inorganic				Organic													
		Chromium (VI)	Chromium	Copper	Lead	1,1 Di-chloro-ethene	1,1 Di-chloro-ethane	1,2 Di-chloro-ethene (total)	Chloro-form	1,1,1-Tri-chloro-ethane	Carbon Tetra-chloride	Tri-chloro-ethene	1,1,2 Trichloro-ethane	Benzene	Tetra-chloro-ethene	1,1,2,2-Tetra-chloro-ethane	Toluene	Ethyl-benzene	Total Xylenes
		ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Reporting Limit *		10	10	10	5.0	0.50	0.50	0.50	0.50	0.50	0.50	0.50	1.0	0.50	0.50	1.0	0.50	0.50	0.50
Cleanup Criteria		100	100	1,300	15	7	200	70	100	200	5	5	5	5	5	0.2	1,000	700	10,000
MW-6	6/18/2002	---	---	---	---	< 0.50	< 0.50	0.28 J	< 0.50	1.8	< 0.50	3.5	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50
MW-6	8/22/2000	---	---	---	---	< 0.50	< 0.50	1.70	< 0.50	3.3	< 0.50	[illegible]	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50
MW-6	7/15/1998	< 10	< 10	< 10	< 5.0	< 0.50	< 0.50	< 0.50	< 0.50	1.6	< 0.50	2.7	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50
MW-6	7/8/1997	< 10	< 10	< 10	< 5.0	< 0.50	< 0.50	1.80	< 0.50	2.70	< 0.50	< 0.50	< 1.0	< 0.50	[illegible]	< 1.0	0.96	< 0.50	< 0.50
MW-6	7/18/1996	< 10	< 10	< 10	< 5.0	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	1.80	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50
MW-6	7/19/1995	< 10	< 10	< 20	< 10	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50
MW-6	7/19/1994	< 10	< 10	< 25	< 6	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	1.20	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50
MW-6	8/25/1993	< 10	< 8.0	< 3.0	< 1.0	< 10	< 10	2	< 10	1	< 10	[illegible]	< 10	< 10	< 10	< 10	< 10	< 10	< 10
MW-6	8/12/1992	< 10	< 10	< 25	< 3.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
MW-6	7/30/1991	< 10	---	10.7	< 1.0	< 10	< 10	3	< 10	< 10	< 10	[illegible]	< 10	< 10	< 10	< 10	< 10	< 10	< 10
MW-6	11/8/1990	< 10	---	< 5.0	2.0	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
MW-6	8/30/1990	< 10	---	< 4.0	3.3	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
MW-6	5/9/1990	< 10	---	< 4.00	11.60	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
MW-6	2/28/1990	< 10	---	< 5.0	11.5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
MW-7S	6/18/2002	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
MW-7S	8/22/2000	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
MW-7S	7/15/1998	< 10	< 10	< 10	< 5.0	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50
MW-7S	7/8/1997	< 10	< 10	< 10	< 5.0	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	1.10	< 0.50	< 0.50
MW-7S	7/17/1996	< 10	< 10	< 10	< 5.0	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50
MW-7S	7/19/1995	< 10	< 10	< 20	< 10	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50
MW-7S	7/19/1994	< 10	< 10	< 25	6	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50
MW-7S	8/25/1993	< 10	< 8.0	3.1	< 1.0	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
MW-7S	11/17/1992	< 10	< 10	< 25	< 3.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
MW-7S	7/31/1991	< 10	---	12.7	< 1.0	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
MW-7S	11/8/1990	< 10	---	< 5.0	< 1.0	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
MW-7S	8/29/1990	< 10	---	4.6	< 1.0	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
MW-7S	5/8/1990	< 10	---	< 4.00	< 2.00	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
MW-7S	2/27/1990	< 10	---	< 5.0	< 1.0	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5

APPENDIX B. GROUNDWATER QUALITY RESULTS SUMMARY, MONITORING WELLS AND PRODUCTION WELLS
1990-2002
JOHN DEERE DUBUQUE WORKS, DUBUQUE, IOWA

Source or Location	Sample Collection Date	Inorganic				Organic													
		Chromium (VI)	Chromium	Copper	Lead	1,1 Di chloro-ethane	1,1 Di-chloro-ethene	1,2 Di chloro-ethene (total)	Chloro-form	1,1,1 Tri-chloro-ethane	Carbon Tetra chloride	Tri-chloro-ethene	1,1,2-Trichloro-ethane	Benzene	Tetra-chloro-ethene	1,1,2,2-Tetra-chloro-ethane	Toluene	Ethyl-benzene	Total Xylenes
		ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Reporting Limit *		10	10	10	5.0	0.50	0.50	0.50	0.50	0.50	0.50	0.50	1.0	0.50	0.50	1.0	0.50	0.50	0.50
Cleanup Criteria		100	100	1,300	15	7	700	70	100	200	5	5	5	5	5	0.2	1,000	700	10,000
MW-8S	8/18/2002	---	---	---	---	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50
MW-8S	8/22/2000	---	---	---	---	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50
MW-8S	7/15/1998	< 10	< 10	< 10	< 5.0	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50
MW-8S	7/8/1997	< 10	< 10	< 10	< 5.0	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	0.87	< 0.50	< 0.50
MW-8S	7/16/1996	< 10	< 10	< 10	< 5.0	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50
MW-8S	7/19/1995	< 10	< 10	< 20	< 10	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50
MW-8S	7/19/1994	< 10	< 10	< 25	< 6	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50
MW-8S	8/25/1993	< 10	< 8.0	< 30	< 1.0	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
MW-8S	8/12/1992	< 10	< 10	< 25	< 3.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
MW-8S	7/2/1991	< 10	---	< 6.0	< 1.0	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
MW-8S	11/7/1990	< 10	---	< 5.0	< 1.0	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
MW-8S	8/30/1990	< 10	---	< 4.0	1.0	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
MW-8S	5/8/1990	20	---	< 4.00	4.60	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
MW-8S	2/26/1990	< 10	---	< 5.0	9.8	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
MW-9S	8/14/2002	---	---	---	---	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	0.28	< 1.0	< 0.50	0.40	< 1.0	< 0.50	< 0.50	< 0.50
MW-9S	8/22/2000	---	---	---	---	< 0.50	1.1	2.9	< 0.50	1.7	< 0.50	1.1	< 1.0	< 0.50	[illegible]	< 1.0	< 0.50	< 0.50	< 0.50
MW-9S	7/15/1998	< 10	< 10	< 10	< 5.0	< 0.50	2.2	3.3	< 0.50	4.4	< 0.50	2.2	< 1.0	< 0.50	[illegible]	< 1.0	< 0.50	< 0.50	< 0.50
MW-9S	7/8/1997	< 10	< 10	< 10	< 5.0	< 0.50	6.80	45.00	< 0.50	19.00	< 0.50	[illegible]	< 1.0	< 0.50	[illegible]	< 1.0	< 0.50	< 0.50	2.50
MW-9S	7/17/1996	< 10	< 10	< 10	< 5.0	< 0.50	1.00	< 0.50	< 0.50	2.20	< 0.50	0.61	< 1.0	< 0.50	2.00	< 1.0	< 0.50	< 0.50	< 0.50
MW-9S	7/19/1995	< 10	< 10	< 20	< 10	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50
MW-9S	7/19/1994	< 10	< 11	< 25	< 6	< 0.50	0.37 J	< 0.50	< 0.50	0.80	< 0.50	< 0.50	< 1.0	< 0.50	1.2	< 1.0	< 0.50	< 0.50	< 0.50
MW-9S	03/24/1993	< 10	< 8.0	< 3.0	1.3	< 10	6	< 10	< 10	23	< 10	[illegible]	< 10	1	[illegible]	< 10	< 10	< 10	< 10
MW-9S	8/11/1992	< 10	< 10	< 25	< 3.0	< 5.0	3.2	3.7	< 5.0	18	< 5.0	[illegible]	< 5.0	< 5.0	[illegible]	< 5.0	< 5.0	< 5.0	< 5.0
MW-9S	7/2/1991	< 10	---	< 6.0	< 1.0	< 10	5	4	< 10	20	< 10	4	< 10	< 10	[illegible]	< 10	< 10	< 10	< 10
MW-9S	11/7/1990	< 10	---	< 5.0	< 1.0	< 5	< 5	< 5	< 5	13	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
MW-9S	8/30/1990	< 10	---	< 4.0	< 1.0	< 5	< 5	< 5	< 5	5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
MW-9S	5/8/1990	< 10	---	< 4.00	< 2.00	< 5	< 5	< 5	< 5	8	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
MW-9S	2/26/1990	< 10	---	< 5.0	4.7	< 5	< 5	< 5	< 5	9	< 5	1	< 5	< 5	4	< 5	< 5	< 5	< 5

APPENDIX B. GROUNDWATER QUALITY RESULTS SUMMARY, MONITORING WELLS AND PRODUCTION WELLS
1950-2002
JOHN DEERE DUBUQUE WORKS, DUBUQUE, IOWA

Source or Location	Sample Collection Date	Inorganic				Organic													
		Chromium (VI)	Chromium	Copper	Lead	1,1-Di-chloro-ethane	1,1-Di-chloro-ethane	1,2-Di-chloro-ethene (total)	Chloro-form	1,1,1-Tri-chloro-ethane	Carbon Tetra-chloride	Tri-chloro-ethene	1,1,2 Trichloro ethane	Benzene	Tetra-chloro-ethene	1,1,2,2-Tetra-chloro-ethane	Toluene	Ethyl-benzene	Total Xylenes
		ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Reporting Limit *		10	10	10	5.0	0.50	0.50	0.50	0.50	0.50	0.50	0.50	1.0	0.50	0.50	1.0	0.50	0.50	0.50
Cleanup Criteria		100	100	1,300	15	7	700	70	100	200	5	5	5	5	5	0.2	1,000	700	10,000
MW-9D	6/18/2002	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
MW-9D	8/22/2000	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
MW-9D	7/21/1998	< 10	< 10	< 10	< 5.0	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50
MW-9D	7/8/1997	< 10	< 10	< 10	< 5.0	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	1.10	< 0.50	< 0.50
MW-9D	7/17/1996	< 10	< 10	< 10	< 5.0	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50
MW-9D	7/19/1995	< 10	< 10	< 20	< 10	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50
MW-9D	7/19/1994	< 10	< 10	< 25	7	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	1.80	< 0.50	< 0.50
MW-9D	8/24/1993	< 10	< 8.0	5.0	< 1.0	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
MW-9D	8/11/1992	< 10	< 10	< 25	< 3.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
MW-9D	7/2/1991	< 10	---	< 6.0	< 1.0	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
MW-9D	11/8/1990	< 10	---	< 5.0	< 1.0	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
MW-9D	8/30/1990	< 10	---	4.8	< 1.0	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
MW-9D	5/9/1990	< 10	---	4.50	< 2.00	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
MW-9D	2/26/1990	< 10	---	< 5.0	1.6	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
MW-11S	6/18/2002	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
MW-11S	8/22/2000	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
MW-11S	7/16/1998	< 10	< 10	< 10	< 5.0	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50
MW-11S	7/8/1997	< 10	< 10	< 10	< 5.0	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50
MW-11S	7/17/1996	< 10	< 10	< 10	< 5.0	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50
MW-11S	7/19/1995	< 10	< 10	< 20	< 10	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50
MW-11S	7/19/1994	< 10	< 10	< 25	< 6	< 0.50	0.26 J	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	0.32 J	< 0.50	< 0.50
MW-11S	9/7/1993	< 10	< 8.0	< 3.0	< 1.0	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
MW-11S	8/12/1992	< 10	< 10	< 25	< 3.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
MW-11S	7/3/1991	< 10	---	< 6.0	< 1.0	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
MW-11S	11/10/1990	22	---	< 5.0	< 1.0	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
MW-11S	8/30/1990	< 10	---	4.3	< 1.0	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
MW-11S	5/10/1990	< 10	---	< 4.00	< 2.00	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
MW-11S	2/27/1990	---	---	< 5.0	< 1.0	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5

APPENDIX B. GROUNDWATER QUALITY RESULTS SUMMARY, MONITORING WELLS AND PRODUCTION WELLS
1993-2002
JOHN DEERE DUBUQUE WORKS, DUBUQUE, IOWA

Source or Location	Sample Collection Date	Inorganic				Organic													
		Chromium (VI)	Chromium	Copper	Lead	1,1 Di chloro ethene	1,1-Di-chloro-ethane	1,2-Di chloro ethene (total)	Chloro-form	1,1,1-Tri chloro-ethane	Carbon Tetra-chloride	Tri-chloro-ethene	1,1,2-Trichloro-ethane	Benzene	Tetra chloro-ethene	1,1,2,2-Tetra-chloro-ethane	Toluene	Ethyl-benzene	Total Xylenes
		ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Reporting Limit *		10	10	10	5.0	0.50	0.50	0.50	0.50	0.50	0.50	0.50	1.0	0.50	0.50	1.0	0.50	0.50	0.50
Cleanup Criteria		100	100	1,300	15	7	700	70	100	200	5	5	5	5	5	0.2	1,000	700	10,000
MW-11D	6/18/2002	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
MW-11D	8/22/2000	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
MW-11D	7/15/1998	< 10	< 10	< 10	< 5.0	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50
MW-11D	7/9/1997	< 10	< 10	< 10	< 5.0	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50
MW-11D	7/17/1996	< 10	< 10	< 10	< 5.0	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50
MW-11D	7/19/1995	< 10	< 10	< 20	< 5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50
MW-11D	7/19/1994	< 10	< 10	< 25	< 6	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50
MW-11D	8/24/1993	19	< 8.0	< 3.0	< 1.0	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
MW-11D	8/12/1992	< 10	< 10	< 25	< 3.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
MW-11D	7/3/1991	< 10	---	< 6.0	< 1.0	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
MW-11D	11/10/1990	< 10	---	< 5.0	< 1.0	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
MW-11D	8/30/1990	12	---	5.8	1.7	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
MW-11D	5/10/1990	< 10	---	< 4.00	< 2.00	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
MW-11D	2/27/1990	< 10	---	< 5.0	2.5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
MW-12	6/18/2002	---	---	---	---	< 0.50	3.2	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50
MW-12	8/22/2000	---	---	---	---	< 0.50	22.0	0.64	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50
MW-12	7/15/1998	< 10	< 10	< 10	< 5.0	< 0.50	3.0	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50
MW-12	7/9/1997	< 10	< 10	< 10	< 5.0	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50
MW-12	7/18/1996	< 10	< 10	< 10	< 5.0	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50
MW-12	7/17/1995	< 10	< 10	< 25	< 10	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	4.4	< 0.50	< 0.50
MW-12	7/19/1994	< 15	< 15	4.3 J	< 6	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50
MW-12	8/7/1993	< 10	< 8.0	5.6	< 1.0	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
MW-12	8/11/1992	< 10	< 10	< 25	< 3.0	< 5.0	23	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
MW-12	7/2/1991	< 10	---	10.7	< 1.0	< 10	29	3	< 10	1	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
MW-12	11/7/1990	< 10	---	< 5.0	1.5	< 5	< 5	7	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
MW-12	8/29/1990	< 10	---	< 4.0	3.1	< 5	10	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
MW-12	5/8/1990	20	---	< 4.00	2.10	< 5	12	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
MW-12	2/26/1990	< 10	---	< 5.0	8.4	< 5	7	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5

APPENDIX B. GROUNDWATER QUALITY RESULTS SUMMARY, MONITORING WELLS AND PRODUCTION WELLS
1990-2002
JOHN DEERE DUBUQUE WORKS, DUBUQUE, IOWA

Source or Location	Sample Collection Date	Inorganic				Organic													
		Chromium (VI)	Chromium	Copper	Lead	1,1-Di-chloro-ethane	1,1-Di-chloro-ethane	1,2-Di chloro-ethene (total)	Chloro-form	1,1,1-Tri-chloro-ethane	Carbon Tetra-chloride	Tri-chloro-ethene	1,1,2-Trichloro-ethane	Benzene	Tetra-chloro-ethene	1,1,2,2-Tetra-chloro-ethane	Toluene	Ethyl benzene	Total Xylenes
		ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Reporting Limit *		10	10	10	5.0	0.50	0.50	0.50	0.50	0.50	0.50	0.50	1.0	0.50	0.50	1.0	0.50	0.50	0.50
Cleanup Criteria		100	100	1,300	15	7	700	70	100	200	5	5	5	5	5	0.2	1,000	700	10,000
MW-13S	6/18/2002	---	---	---	---	< 0.50	< 0.50	0.23 J	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0		< 0.50	< 1.0	87 J	250 J	520 J
MW-13S	8/22/2000	---	---	---	---	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0		< 0.50	< 1.0	2.4	150.0	130.0
MW-13S	7/15/1998	< 10	< 10	< 10	< 5.0	< 0.50	1.4	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0		< 0.50	< 1.0	1.9	0.3	3.7
MW-13S	7/9/1997	< 10	< 10	< 10	< 5.0	< 0.50	1.20	2.40	< 0.50	< 0.50	< 0.50	0.51	< 1.0		0.64	< 1.0	2.60	72.00	60.00
MW-13S	7/16/1996	< 10	< 10	< 10	< 5.0	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50
MW-13S	7/18/1995	< 10	< 10	< 25	< 20	< 0.62	1.5	0.8	< 0.50	9.3	< 0.50		< 1.0	1.8	4.0	< 1.0	< 0.50	< 0.50	< 0.50
MW-13S	7/19/1994	< 10	< 10	< 25	< 6	< 0.50	< 0.50	< 0.50	< 0.50	< 0.5	< 0.50	0.51	< 1.0	< 0.50	1.3	< 1.0	< 0.50	< 0.50	< 0.50
MW-13S	8/25/1993	< 10	< 8.0	3.9	1.5	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
MW-13S	8/12/1992	< 10	< 10	< 25	< 3.0	< 5.0	< 5.0	< 5.0	1.3	< 5.0	< 5.0	< 5.0	< 5.0		< 5.0	< 5.0	2.0	6.1	10
MW-13S	7/3/1991	< 10	---	10.6	< 1.0	< 10	< 10	< 10	< 10	1	< 10	< 10	< 10	< 10		< 10	< 10	2	4
MW-13S	11/8/1990	< 10	---	< 5.0	< 1.0	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5		< 5	< 5	< 5	< 5
MW-13S	8/29/1990	< 10	---	6.0	< 1.0	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5		< 5	< 5	< 5	< 5
MW-13S	5/9/1990	< 10	---	< 4.00	< 2.00	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5		< 5	< 5	< 5	< 5
MW-13S	2/26/1990	< 10	---	< 5.0	3.1	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5		< 5	< 5	< 5	< 5
MW-13D	6/18/2002	---	---	---	---	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50
MW-13D	8/22/2000	---	---	---	---	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50
MW-13D	7/15/1998	< 10	< 10	< 10	< 5.0	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50
MW-13D	7/9/1997	< 10	< 10	< 10	< 5.0	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50
MW-13D	7/16/1996	< 10	< 10	< 10	< 5.0	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	0.70	< 1.0	< 0.50	2.00	< 1.0	< 0.50	< 0.50	< 0.50
MW-13D	7/18/1995	< 10	< 10	< 25	< 5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50
MW-13D	7/19/1994	< 10	< 10	< 25	< 6	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50
MW-13D	8/24/1993	< 10	< 8.0	< 3.0	< 1.0	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
MW-13D	8/12/1992	< 10	< 10	< 25	< 3.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
MW-13D	7/3/1991	< 10	---	< 6.0	< 1.0	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
MW-13D	11/8/1990	< 10	---	< 5.0	< 1.0	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
MW-13D	8/29/1990	< 10	---	4.6	1.6	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
MW-13D	5/9/1990	< 10	---	< 4.00	< 2.00	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
MW-13D	2/27/1990	< 10	---	< 5.0	3.3	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5

APPENDIX D. GROUNDWATER QUALITY RESULTS SUMMARY, MONITORING WELLS AND PRODUCTION WELLS
1953-2002
JOHN DEERE DUBUQUE WORKS, DUBUQUE, IOWA

Source or Location	Sample Collection Date	Inorganic				Organic													
		Chromium (VI)	Chromium	Copper	Lead	1,1-Di-chloro-ethene	1,1-Di-chloro-ethane	1,2-Di chloro-ethane (total)	Chloro-form	1,1,1-Tri-chloro-ethane	Carbon Tetra-chloride	Tri chloro-ethene	1,1,2-Trichloro-ethane	Benzene	Tetra chloro-ethene	1,1,2,2-Tetra-chloro-ethane	Toluene	Ethyl-benzene	Total Xylenes
		ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Reporting Limit [a]		10	10	10	5.0	0.50	0.50	0.50	0.50	0.50	0.50	0.50	1.0	0.50	0.50	1.0	0.50	0.50	0.50
Cleanup Criteria		100	100	1,300	15	7	700	70	100	200	5	5	5	5	5	0.2	1,000	700	10,000
MW-16	6/13/2002	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
MW-16	8/22/2000	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
MW-16	7/16/1998	< 10	< 10	< 10	< 5.0	< 0.50	< 0.50	< 0.50	< 0.50	0.65	< 0.50	0.84	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50
MW-16	7/9/1997	< 10	< 10	< 10	< 5.0	< 0.50	< 0.50	< 0.50	< 0.50	0.77	< 0.50	1.30	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50
MW-16	7/18/1996	< 10	< 10	< 10	< 5.0	< 0.50	< 0.50	< 0.50	< 0.50	1.40	< 0.50	1.70	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50
MW-16	7/18/1995	< 10	< 10	< 25	< 10	< 0.50	< 0.50	0.91	< 0.50	2.5	< 0.50	2.9	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50
MW-16	7/19/1994	< 10	< 10	< 25	< 12	< 0.50	< 0.50	< 0.50	< 0.50	1.3	< 0.50	3.5	< 1.0	< 0.50	0.31 J	< 1.0	< 0.50	< 0.50	< 0.50
MW-16	8/25/1993	< 10	< 8.0	< 3.0	< 1.0	< 10	< 10	1	< 10	1	< 10	2	< 10	< 10	< 10	< 10	< 10	< 10	< 10
MW-16	8/11/1992	< 10	< 10	< 25	< 3.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	2.3	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
MW-16	2/2/1991	< 10	---	< 6.0	< 1.0	< 10	< 10	< 10	< 10	1	< 10	[redacted]	< 10	< 10	< 10	< 10	< 10	< 10	< 10
MW-16	11/7/1990	< 10	---	< 5.0	< 1.0	< 5	< 5	< 5	< 5	< 5	< 5	[redacted]	< 5	< 5	< 5	< 5	< 5	< 5	< 5
MW-16	8/29/1990	< 10	---	6.2	2.1	< 5	< 5	< 5	< 5	< 5	< 5	[redacted]	< 5	< 5	< 5	< 5	< 5	< 5	< 5
MW-16	5/10/1990	< 10	---	< 4.00	< 2.00	< 5	< 5	< 5	< 5	< 5	< 5	[redacted]	< 5	< 5	< 5	< 5	< 5	< 5	< 5
MW-16	2/28/1990	< 10	---	< 5.0	3.2	< 5	< 5	< 5	< 5	< 5	< 5	[redacted]	< 5	< 5	< 5	< 5	< 5	< 5	< 5
MW-20S	6/18/2002	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
MW-20S	8/22/2000	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
MW-20S	7/16/1998	< 10	< 10	< 10	< 5.0	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50
MW-20S	7/7/1997	< 10	< 10	< 10	< 5.0	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50
MW-20S	7/17/1996	< 10	< 10	< 10	< 5.0	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50
MW-20S	7/18/1995	< 10	< 10	< 25	< 10	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50
MW-20S	7/19/1994	< 10	< 10	< 25	< 6	< 0.50	< 0.50	< 0.50	< 0.50	0.34 J	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50
MW-20S	9/7/1993	< 10	< 8.0	< 3.0	< 1.0	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
MW-20S	8/12/1992	< 10	< 10	< 25	< 3.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
MW-20S	8/22/1991	< 10	---	7.3	< 1.0	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
MW-20S	11/9/1990	< 10	---	< 5.0	< 1.0	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
MW-20S	8/29/1990	< 10	---	< 4.0	3.1	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
MW-20S	5/11/1990	< 10	---	< 4.00	2.60	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
MW 20S	2/27/1990	< 10	---	< 5.0	2.3	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5

APPENDIX B. GROUNDWATER QUALITY RESULTS SUMMARY, MONITORING WELLS AND PRODUCTION WELLS
1990-2002
JOHN DEERE DUBUQUE WORKS, DUBUQUE, IOWA

Source or Location	Sample Collection Date	Inorganic				Organic													
		Chromium (VI)	Chromium	Copper	Lead	1,1-Di chloro-ethene	1,1-Di chloro-ethane	1,2 Di chloro ethene (total)	Chloro-form	1,1,1 Tri-chloro-ethane	Carbon Tetra-chloride	Tri-chloro-ethene	1,1,2-Trichloro-ethane	Benzene	Tetra-chloro-ethene	1,1,2,2 Tetra-chloro-ethane	Toluene	Ethyl-benzene	Total Xylenes
		ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Reporting Limit *		10	10	10	5.0	0.50	0.50	0.50	0.50	0.50	0.50	0.50	1.0	0.50	0.50	1.0	0.50	0.50	0.50
Cleanup Criteria		100	100	1,300	15	7	700	70	100	200	5	5	5	5	5	0.2	1,000	700	10,000
MW-20D	6/18/2002	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
MW-20D	8/22/2000	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
MW-20D	7/16/1998	< 10	< 10	< 10	< 5.0	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50
MW-20D	7/7/1997	< 10	< 10	< 10	< 5.0	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50
MW-20D	7/17/1996	< 10	< 10	< 10	< 5.0	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50
MW-20D	7/18/1995	< 10	< 10	< 25	< 10	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50
MW-20D	7/19/1994	< 15	< 15	< 25	< 6	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50
MW-20D	8/25/1993	< 10	< 8.0	< 3.0	< 1.0	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
MW-20D	8/11/1992	< 10	< 10	< 25	< 3.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
MW-20D	7/3/1991	< 10	---	< 10.0	< 1.0	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
MW-20D	11/6/1990	< 10	---	< 5.0	< 1.0	< 5	< 5	< 5	< 5	5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
MW-20D	8/30/1990	12	---	< 4.0	2.2	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
MW-20D	5/11/1990	< 10	---	< 4.00	< 2.00	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
MW-20D	2/27/1990	< 10	---	< 5.0	2.7	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
PW-3A	6/18/2002	---	---	---	---	< 0.50	3.1	3.9	< 0.50	1.4	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	0.93
PW-3A	8/22/2000	---	---	---	---	< 0.50	2.00	2.7	< 0.50	1.7	< 0.50	< 0.50	< 1.0	< 0.50	0.51	< 1.0	< 0.50	< 0.50	< 0.50
PW-3A	7/16/1998	< 10	< 10	< 10	< 5.0	< 0.50	1.40	2.9	< 0.50	1.7	< 0.50	< 0.50	< 1.0	0.81	< 0.50	< 1.0	< 0.50	< 0.50	1.1
PW-3A	7/8/1997	< 10	< 10	< 10	< 5.0	< 0.50	4.70	5.60	< 0.50	2.40	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	0.53	< 0.50	0.58
PW-3A	9/4/1996	< 10	< 10	< 10	< 5.0	< 0.50	< 0.50	< 0.50	35	< 0.50	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	16	< 0.50	< 0.50
PW-3	7/16/1996	< 10	< 10	< 10	< 5.0	< 0.50	2.70	6.30	< 0.50	2.50	< 0.50	< 0.50	< 1.0	[illegible]	< 0.50	< 1.0	7.50 J	44.00 J	140.00 J
PW-3	7/18/1995	< 10	< 10	< 25	< 10	< 0.50	1.6	4.5	< 0.50	1.7	< 0.50	< 0.50	< 1.0	2.9	< 0.50	< 1.0	1.9	25	50
PW-3	7/19/1994	< 10	< 10	< 25	< 3	< 0.50	2.9	< 0.50	< 0.50	1.8	< 0.50	< 0.50	< 1.0	[illegible]	< 0.50	< 1.0	4.9	30	110
PW-3	8/23/1993	< 10	< 8.0	< 3.0	< 1.0	< 10	3	10	< 10	< 10	< 10	< 10	< 10	[illegible]	< 10	< 10	16	71	340
PW-3	8/10/1992	< 10	< 10	< 25	< 3.0	< 12	< 12	< 12	< 12	< 12	< 12	< 12	< 12	< 12	< 12	< 12	< 12	72	100
PW-3	7/2/1991	< 10	---	< 6.0	< 1.0	< 25	3	30	< 25	3	< 25	< 25	< 25	[illegible]	< 25	< 25	14	63	210
PW-3	11/8/1990	< 10	---	< 5.0	< 1.0	< 5	< 5	9	< 5	< 5	< 5	< 5	< 10	< 5	< 5	< 5	< 5	17	53
PW-3	8/28/1990	< 10	---	< 4.0	< 1.0	< 10	< 10	17	< 10	< 10	< 10	< 10	< 10	---	< 10	< 10	10	32	130
PW-3	5/10/1990	< 10	---	< 4.00	< 2.00	< 25	< 25	37	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	33	150
PW-3	2/28/1990	< 10	---	< 5.0	1.2	< 5	2	56	< 5	1	< 5	4	< 5	[illegible]	< 5	< 5	15	33	140

APPENDIX B. GROUNDWATER QUALITY RESULTS SUMMARY, MONITORING WELLS AND PRODUCTION WELLS
1993-2002
JOHN DEERE DUBUQUE WORKS, DUBUQUE, IOWA

Source or Location	Sample Collection Date	Inorganic				Organic													
		Chromium (VI)	Chromium	Copper	Lead	1,1-Dichloroethene	1,1-Dichloroethane	1,2 Dichloroethane (total)	Chloroform	1,1,1-Trichloroethane	Carbon Tetrachloride	Trichloroethene	1,1,2-Trichloroethane	Benzene	Tetrachloroethene	1,1,2,2-Tetrachloroethane	Toluene	Ethylbenzene	Total Xylenes
		ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Reporting Limit *		10	10	20	5.0	0.50	0.50	0.50	0.50	0.50	0.50	0.50	1.0	0.50	0.50	1.0	0.50	0.50	0.50
Cleanup Criteria		100	100	1,300	15	7	700	70	100	200	5	5	5	5	5	0.2	1,000	700	10,000
PW-4A	6/18/2002	---	---	---	---	< 0.50	< 0.50	0.55	< 0.50	0.86	< 0.50	1.5	< 1.0	0.74 J	< 0.50	< 1.0	< 0.50 UJ	1.4 J	6.2 J
PW-4A	8/22/2000	---	---	---	---	< 0.50	< 0.50	0.66	< 0.50	1.20	< 0.50	1.8	< 1.0	1.60	0.67	< 1.0	0.39	6.4	29
PW-4A	7/14/1998	< 10	< 10	< 10	< 5.0	< 0.50	< 0.50	< 0.50	< 0.50	1.20	< 0.50	1.4	< 1.0	0.79	< 0.50	< 1.0	< 0.50	7.1	25
PW-4A	7/9/1997	< 10	< 10	< 10	< 5.0	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0	2.10	< 0.50	< 1.0	0.51	7.40	22.00
PW-4A	7/16/1996	< 10	< 10	< 10	< 5.0	< 0.50	0.59	1.30	< 0.50	1.80	< 0.50	2.60	< 1.0	0.99	0.50	< 1.0	0.79	7.00	28.00
PW-4A	7/18/1995	< 10	< 10	< 25	< 10	< 0.50	< 0.50	0.52	< 0.50	0.71	< 0.50	1.5	< 1.0	1.9	< 0.50	< 1.0	< 0.50	12	45
PW-4	7/19/1994	< 10	< 10	< 25	< 6	< 0.50	0.48 J	< 0.50	< 0.50	1.20	< 0.50	2.7	< 1.0	---	0.62	< 1.0	< 0.50	3.0	8.5
PW-4	8/23/1993	< 10	< 8.0	< 3.0	< 1.0	< 10	1	2	< 10	2	< 10	[illegible]	< 10	3	1	< 10	< 10	8	30
PW-4	8/10/1992	< 10	< 10	< 25	< 3.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	0.4
PW-4	7/2/1991	< 10	---	< 6.0	< 1.0	< 10	< 10	< 10	< 10	3	< 10	3	< 10	3	< 10	< 10	< 10	3	10
PW-4	11/7/1990	< 10	---	< 5.0	< 1.0	< 5	< 5	< 5	< 5	< 5	< 5	[illegible]	< 5	< 5	< 5	< 5	< 5	< 5	12
PW-4	8/23/1990	< 10	---	4.6	< 1.0	< 5	< 5	< 5	< 5	6	< 5	[illegible]	< 5	< 5	< 5	< 5	< 5	< 5	11
PW-4	5/10/1990	< 10	---	< 4.00	< 2.00	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	5	20
PW-4	2/28/1990	< 10	---	< 5.0	< 1.0	< 5	< 5	< 5	< 5	3	< 5	3	< 5	< 5	< 5	< 5	< 5	3	7
PW-5	6/18/2002	---	---	---	---	< 0.50	< 0.50	0.19 J	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0	1.1 J	< 0.50	< 1.0	0.48 J	3.0 J	1.3 J
PW-5	8/22/2000	---	---	---	---	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0	[illegible]	< 0.50	< 1.0	5.3	52	130
PW-5	7/15/1998	< 10	< 10	< 10	3.3	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	4.8	30	150
PW-5	7/9/1997	< 10	< 10	< 10	< 5.0	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50
PW-5	7/16/1996	< 10	< 10	< 10	< 5.0	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50
PW-5	7/18/1995	< 10	< 10	< 25	< 10	< 0.50	< 0.50	0.71	< 0.50	0.83	< 0.50	1.0	< 1.0	[illegible]	< 0.50	< 1.0	38	55	270
PW-5	7/19/1994	< 10	< 10	< 25	< 3	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50
PW-5	8/24/1993	< 10	< 8.0	3.3	< 1.0	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	21	27	217
PW-5	8/10/1992	< 10	< 10	< 25	< 3.0	< 8.5	< 8.5	< 8.5	< 8.5	< 8.5	< 8.5	< 8.5	< 8.5	< 8.5	< 8.5	< 8.5	55	49	250
PW-5	7/1/1991	< 10	---	< 10.0	< 1.0	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
PW-5	11/9/1990	< 10	---	< 5.0	< 1.0	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	23	22	100
PW-5	8/28/1990	< 10	---	6.2	0.6	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	40	39	180
PW-5	5/10/1990	< 10	---	< 4.00	7.20	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	75	54	320
PW-5	2/28/1990	< 10	---	< 5.0	5.6	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5

APPENDIX B. GROUNDWATER QUALITY RESULTS SUMMARY, MONITORING WELLS AND PRODUCTION WELLS
1990-2002
JOHN DEERE DUBUQUE WORKS, DUBUQUE, IOWA

Source or Location	Sample Collection Date	Inorganic				Organic													
		Chromium (VI)	Chromium	Copper	Lead	1,1-Di-chloro-ethene	1,1-Di-chloro-ethane	1,2-Di chloro-ethene (total)	Chloro-form	1,1,1-Tri-chloro-ethane	Carbon Tetra-chloride	Tri chloro-ethene	1,1,2-Trichloro-ethane	Benzene	Tetra-chloro-ethene	1,1,2,2-Tetra-chloro-ethane	Toluene	Ethyl-benzene	Total Xylenes
		ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Reporting Limit °		10	10	10	5.0	0.50	0.50	0.50	0.50	0.50	0.50	0.50	1.0	0.50	0.50	1.0	0.50	0.50	0.50
Clean up Criteria		100	100	1,300	15	7	700	70	100	200	5	5	5	5	5	0.2	1,000	700	10,000
PW-7A	6/18/2002	---	---	---	---	< 0.50	< 0.50	0.17 J	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50
PW-7A	8/22/2000	---	---	---	---	< 0.50	< 0.50	< 0.50	< 0.50	0.42	< 0.50	0.73	< 1.0	< 0.50	0.69	< 1.0	< 0.50	< 0.50	< 0.50
PW-7A	7/14/1998	< 10	< 10	< 10	< 5.0	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50
PW-7A	7/9/1997	< 10	< 10	< 10	< 5.0	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50
PW-7A	7/16/1996	< 10	< 10	< 10	< 5.0	< 0.50	< 0.50	< 0.50	< 0.50	0.52	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50
PW-7	7/18/1995																		
PW-7	7/19/1994	< 10	< 10	< 25	< 3	< 0.50	< 0.50	< 0.50	< 0.50	0.31 J	< 0.50	0.32 J	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50
PW-7	9/23/1993	< 10	< 8.0	< 3.0	< 1.0	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
PW-7	8/10/1992	< 10	< 10	< 25	< 3.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
PW-7	7/2/1991	< 10	---	< 6.0	< 1.0	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
PW-7	11/7/1990	< 10	---	8.2	< 1.0	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
PW-7	8/28/1990	< 10	---	5.7	< 1.0	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
PW-7	5/23/1990	< 10	---	4.20	< 2.00	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
PW-7	2/28/1990	< 10	---	< 5.0	1.7	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
SBW-3N	6/18/2002	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
SBW-3N	8/22/2000	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
SBW-3N	7/14/1998	67	62	< 10	4.0	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50
SBW-3N	7/7/1997	40	51	< 10	< 5.0	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50
SBW-3N	7/16/1996	< 10	98	< 10	< 5.0	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50
SBW-3	7/18/1995																		
SBW-3	7/19/1994	37	38	< 25	< 6	< 0.50	< 0.50	< 0.50	0.26 J	1.2	< 0.50	0.49 J	< 1.0	< 0.50	0.43 J	< 1.0	< 0.50	< 0.50	< 0.50
SBW-3	9/23/1993	39	29.2	4.5	< 1.0	< 10	< 10	< 10	< 10	2	< 10	1	< 10	< 10	1	< 10	< 10	< 10	< 10
SBW-3	8/11/1992	42	39	< 25	< 3.0	< 5.0	< 5.0	< 5.0	< 5.0	5.8	< 5.0	2.0	< 5.0	< 5.0	[illegible]	< 5.0	< 5.0	< 5.0	< 5.0
SBW-3	7/4/1991	58	---	11.0	< 1.0	< 10	2	< 10	< 10	13	< 10	3	< 10	< 10	[illegible]	< 10	< 10	< 10	< 10
SBW-3	11/8/1990	30	---	< 5.0	< 1.0	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
SBW-3	8/30/1990	70	---	6.2	< 1.0	< 5	< 5	< 5	< 5	15	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
SBW-3	5/9/1990	40	---	< 4.00	< 2.00	< 5	8	< 5	< 5	34	< 5	[illegible]	< 5	< 5	< 5	< 5	< 5	< 5	< 5
SBW-3	2/28/1990	17	---	< 5.0	< 1.0	< 5	< 5	< 5	< 5	13	< 5	3	< 5	< 5	1	< 5	< 5	< 5	< 5

APPENDIX B. GROUNDWATER QUALITY RESULTS SUMMARY, MONITORING WELLS AND PRODUCTION WELLS
1980-2002
JOHN DEERE DUBUQUE WORKS, DUBUQUE, IOWA

Source or Location	Sample Collection Date	Inorganic				Organic													
		Chromium (VI)	Chromium	Copper	Lead	1,1-Di chloro-ethene	1,1-Di chloro-ethane	1,2 Di chloro-ethene (total)	Chloro-form	1,1,1-Tri chloro-ethane	Carbon Tetra chloride	Tri-chloro-ethene	1,1,2 Trichloro-ethane	Benzene	Tetra-chloro-ethene	1,1,2,2-Tetra-chloro-ethane	Toluene	Ethyl-benzene	Total Xylenes
		ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Reporting Limit *		10	10	10	5.0	0.50	0.50	0.50	0.50	0.50	0.50	0.50	1.0	0.50	0.50	1.0	0.50	0.50	0.50
Cleanup Criteria		100	100	1,300	15	7	700	70	100	200	5	5	5	5	5	0.2	1,000	700	10,000
# Samples		215	125	215	215	235	235	235	235	235	235	235	235	235	235	235	235	235	235
# Detected Values		17	6	26	36	0	32	38	2	57	0	51	0	27	31	0	33	36	42
Maximum Value		140	98	12.7	11.6	< 25	29.00	56.00	35	34	< 10	11	< 25	130	28	< 50	75	250	520
Minimum Value		< 10	< 8	< 10	< 5.0	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 1.0	< 0.50	< 0.50	< 0.50

Laboratory services provided by Quanterra Environmental Services, Arvada, Colorado
ug/L = micrograms per liter
(dup) = Duplicate sample
< = Not detected at or above specified detection limit
* = Reporting limit was raised by the Laboratory for some compounds as noted to address matrix interference.
NA = Not analyzed
Bold = Detected Values
Bold/Highlighted = Detected values above cleanup criteria
d:\95\WTBL\groundwa

Appendix C

NPDES Permits

STATE OF IOWA
DEPARTMENT OF NATURAL RESOURCES
ENVIRONMENTAL PROGRAM
AMENDMENT TO NPDES PERMIT

Iowa Operation Permit No: 31-26-1-07
Date of Issuance: 09-03-1992
Date of Expiration: 09-01-1997
Date of this Amendment: 08-14-1995
EPA NUMBER: IA0000051

Name and Mailing Address of Applicant:

John Deere Dubuque Works
18600 South John Deere Road
Dubuque, Iowa 52004

Identity and Location of Facility:

John Deere Dubuque Works
Section 35, T 90N, R 2E - Dubuque County, Iowa

Pursuant to the authority of Iowa Code Section 455B.174, and of Rule 567--64.3, Iowa Administrative Code, the Director of the Iowa Department of Natural Resources has issued the above referenced permit. Pursuant to the same authority the Director hereby amends said permit as set forth below:

Due to the installation of a new skimmer pond to Outfall 006, the NPDES permit shall be revised as follows:

1) A new Outfall (801) shall be added to combine the discharge from outfalls and acute toxicity shall be added.
2) The description of Outfall 006 shall be revised.
3) Effluent limitations and monitoring requirements for Outfalls 005 and 006 shall be revised.

Replace your NPDES Permit with the attached replacement pages.

For the Department of Natural Resources:

Larry J. Wilson, Director

By _____
WAYNE FARRAND, Supervisor
Wastewater Section

ENVIRONMENTAL PROTECTION DIVISION

IOWA DEPARTMENT OF NATURAL RESOURCES
NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT

PERMITTEE

JOHN DEERE DUBUQUE WORKS
18600 SOUTH JOHN DEERE ROAD
P.O. BOX 538
DUBUQUE, IA 52004

IOWA NPDES PERMIT NUMBER: 31-26-1-07

DATE OF ISSUANCE: 09-03-1992

DATE OF EXPIRATION: 09-01-1997

YOU ARE REQUIRED TO FILE FOR RENEWAL OF THIS PERMIT BY: 03-05-1997

EPA NUMBER - IA 0000051

IDENTITY AND LOCATION OF FACILITY

JOHN DEERE DUBUQUE WORKS
Section 35, T 90N, R 2E
DUBUQUE County, Iowa

RECEIVING WATERCOURSE

MISSISSIPPI RIVER AND LITTLE MAQUOKETA RIVER

ROUTE OF FLOW

This permit is issued pursuant to the authority of section 402(b) of the Clean Water Act (33 U.S.C. 1342(b)), Iowa Code section 455B.174, and rule 567–64.3, Iowa Administrative Code. You are authorized to operate the disposal system and to discharge the pollutants specified in this permit in accordance with the effluent limitations, monitoring requirements and other terms set forth in this permit.

You may appeal any conditions of this permit by filing written notice of appeal and request for administrative hearing with the director of this department within 30 days of receipt of this permit.

Any existing, unexpired Iowa operation permit of Iowa NPDES permit previously issued by the department for the facility identified above is revoked by the issuance of this Iowa NPDES operation permit.

FOR THE DEPARTMENT OF NATURAL RESOURCES

Larry J. Wilson, Director

By _____

WAYNE FARRAND, Supervisor
Wastewater Section
ENVIRONMENTAL PROTECTION DIVISION

Facility Name: JOHN DEERE DUBUQUE WORKS

Effluent Limitations

Permit Number: 3126107

OUTFALL NO.: 002 NONCONTACT COOLING WATER, DRINKING FOUNTAIN DRAINS AND STORM WATER DISCHARGE THROUGH THE NORTH SEDIMENTATION PON

You are prohibited from discharging pollutants except in compliance with the following effluent limitations:

			EFFLUENT LIMITATIONS							
			Concentration				Mass			
Wastewater Parameter	Season	Type	7 Day Average	30 Day Average	Daily Maximum	Units	7 Day Average	30 Day Average	Daily Maximum	Units
FLOW	YEARLY	FINAL		2.5340	3.8000	MGD				
PH (MINIMUM - MAXIMUM)	YEARLY	FINAL	6.0000		9.0000	STD UNITS				
CHLORINE,TOTAL RESIDUAL	YEARLY	FINAL		.0930	.1400	MG/L		1.00	1.50	LBS/DAY
OIL AND GREASE	YEARLY	FINAL		10.0000	15.0000	MG/L		211.00	317.00	LBS/DAY
TEMPERATURE	YEARLY	FINAL			95.0000	FARENHEIT				
ACUTE TOXICITY, CERIODAPHNIA	YEARLY	FINAL						1.00		NON TOXIC
ACUTE TOXICITY, PIMEPHALES	YEARLY	FINAL						1.00		NON TOXIC

NOTE: If seasonal limits apply, summer is from April 1 through October 31, and winter is from November 1 through March 31.

Permit Number: 3126107

Outfall Number	Description
002	NONCONTACT COOLING WATER, DRINKING FOUNTAIN DRAINS AND STORM WATER DISCHARGE THROUGH THE NORTH SEDIMENTATION POND WHICH IS EQUIPPED WITH AN OIL SKIMMER.
003	TREATED DOMESTIC WASTEWATER FROM AN EXTENDED AERATION TREATMENT PLANT WITH POLISHING POND.
004	CONDENSER COOLING WATER FROM ELECTRICAL GENERATOR.
005	NON-CONTACT COOLING WATER, DRINKING FOUNTAIN DRAINS AND STORM WATER DISCHARGE THROUGH THE SOUTH SEDIMENTATION POND WHICH IS EQUIPPED WITH AN OIL SKIMMER.
006	STORMWATER DISCHARGE FROM BUILDINGS W-3,4,5 AND C-26,27 THROUGH THE NEW SEDIMENTATION POND WHICH IS EQUIPPED WITH AN OIL SKIMMER.
008	DISCHARGE CONSISTS OF TRACTOR WASH BOOTH DRAIN, OPTIONAL LANDFILL LEACHATE WHEN RECIRCULATION IS NOT VIABLE AND STORM WATER DISCHARGE THRU A SEDININTATION POND
009	BUILDING Y STORM WATER ONLY DISCHARGE.
010	DRINKING FOUNTAIN DRAINS AND BUILDING W-6 STORM WATER DISCHARGE.
011	WASTEWATER FROM A PHYSICAL CHEMICAL AND BIOLOGICAL TREATMENT PLANT WHICH TREATS ALL PROCESS WASTEWATER FROM THE FACILITY.
014	NORTH END AREA STORM WATER ONLY DISCHARGE FROM A PALLET RECLAIM AND SCRAP SALVAGE AREA.
015	NORTH V-1 STORM WATER ONLY DISCHARGE FROM A PARTS STORAGE YARD.
016	NORTH Y-LOT AREA STORM WATER ONLY DISCHARGE FROM A TRACTOR STORAGE YARD.
017	RINGLE YARD AREA STORM WATER ONLY DISCHARGE FROM A TRACTOR STORAGE AND SHIPPING YARD.
018	CENTER Y-LOT STORM WATER ONLY DISCHARGE FROM A TRACTOR STORAGE YARD.
019	SOUTH Y-LOT STORM WATER ONLY DISCHARGE FROM A TRACTOR STORAGE YARD.
020	SOUTH TRUCK GATE STORM WATER ONLY DISCHARGE FROM VEHICLE PARKING AREAS.
021	BUILDING X-16 STORM WATER ONLY DISCHARGE.
022	LANDFILL RAVINE STORM WATER ONLY DISCHARGE.
023	GOTTSCHALK RAVINE STORM WATER ONLY DISCHAGRE FROM A NATURAL RAVINE.
024	SITE 4 TEST AREA STORMWATER ONLY DISCHARGE.
025	NW CORNER PROPERTY STORM WATER ONLY DISCHARGE.
026	GULER RAVINE STORM WATER ONLY DISCHARGE.
027	X-18 ACCESS ROAD STORM WATER ONLY DISCHARGE.
028	DIRT DRAW BAR AREA STORM WATER ONLY DISCHARGE.
801	COMBINED DISCHARGE OF OUTFALLS 005 AND 006.

Facility Name: JOHN DEERE DUBUQUE WORKS

Effluent Limitations

Permit Number: 3126107

OUTFALL NO.: 003 TREATED DOMESTIC WASTEWATER FROM AN EXTENDED AERATION TREATMENT PLANT WITH POLISHING POND.

You are prohibited from discharging pollutants except in compliance with the following effluent limitations:

			EFFLUENT LIMITATIONS							
			Concentration				Mass			
Wastewater Parameter	Season	Type	7 Day Average	30 Day Average	Daily Maximum	Units	7 Day Average	30 Day Average	Daily Maximum	Units
FLOW	YEARLY	FINAL		.2000	.2400	MGD				
BIOCHEMICAL OXYGEN DEMAND (BOD5)	YEARLY	FINAL		30.0000	45.0000	MG/L		50.00	75.00	LBS/DAY
TOTAL SUSPENDED SOLIDS	YEARLY	FINAL		30.0000	45.0000	MG/L		50.00	75.00	LBS/DAY
PH (MINIMUM - MAXIMUM)	YEARLY	FINAL	6.0000		9.0000	STD UNITS				
COLIFORM,FECAL	SUMMER	FINAL			20.7000	10*3#/100				
TEMPERATURE	YEARLY	FINAL			95.0000	FARENHEIT				

NOTE: If seasonal limits apply, summer is from April 1 through October 31, and winter is from November 1 through March 31.

Facility Name: JOHN DEERE DUBUQUE WORKS

Effluent Limitations

Permit Number: 3126107

OUTFALL NO.: 004 CONDENSER COOLING WATER FROM ELECTRICAL GENERATOR.

You are prohibited from discharging pollutants except in compliance with the following effluent limitations:

Wastewater Parameter	Season	Type	EFFLUENT LIMITATIONS							
			Concentration				Mass			
			7 Day Average	30 Day Average	Daily Maximum	Units	7 Day Average	30 Day Average	Daily Maximum	Units
FLOW	YEARLY	FINAL		21.0000	23.0000	MGD				
PH (MINIMUM - MAXIMUM)	YEARLY	FINAL	6.0000		10.0000	STD UNITS				
CHLORINE,TOTAL RESIDUAL	YEARLY	FINAL			.2000	MG/L				

NOTE: If seasonal limits apply, summer is from April 1 through October 31, and winter is from November 1 through March 31.

Facility Name: JOHN DEERE DUBUQUE WORKS

Effluent Limitations

Permit Number: 3126107

OUTFALL NO.: 005 NON-CONTACT COOLING WATER, DRINKING FOUNTAIN DRAINS AND STORM WATER DISCHARGE THROUGH THE SOUTH SEDIMENTATION PO

You are prohibited from discharging pollutants except in compliance with the following effluent limitations:

			EFFLUENT LIMITATIONS							
			Concentration				Mass			
Wastewater Parameter	Season	Type	7 Day Average	30 Day Average	Daily Maximum	Units	7 Day Average	30 Day Average	Daily Maximum	Units
PH (MINIMUM - MAXIMUM)	YEARLY	FINAL	6.0000		9.0000	STD UNITS				
OIL AND GREASE	YEARLY	FINAL		10.0000	15.0000	MG/L				
TEMPERATURE	YEARLY	FINAL			95.0000	FARENHEIT				

NOTE: If seasonal limits apply, summer is from April 1 through October 31, and winter is from November 1 through March 31.

Facility Name: JOHN DEERE DUBUQUE WORKS

Effluent Limitations

Permit Number: 3126107

OUTFALL NO.: 006 STORMWATER DISCHARGE FROM BUILDINGS W-3,4,5 AND C-26,27 THROUGH THE NEW SEDIMENTATION POND WHICH IS EQUIPPED WIT

You are prohibited from discharging pollutants except in compliance with the following effluent limitations:

			EFFLUENT LIMITATIONS							
			Concentration				Mass			
Wastewater Parameter	Season	Type	7 Day Average	30 Day Average	Daily Maximum	Units	7 Day Average	30 Day Average	Daily Maximum	Units
PH (MINIMUM - MAXIMUM)	YEARLY	FINAL	6.0000		9.0000	STD UNITS				
OIL AND GREASE	YEARLY	FINAL		10.0000	15.0000	MG/L				
TEMPERATURE	YEARLY	FINAL			95.0000	FARENHEIT				

NOTE: If seasonal limits apply, summer is from April 1 through October 31, and winter is from November 1 through March 31.

Effluent Limitations

Permit Number: 3126107

OUTFALL NO.: 008 DISCHARGE CONSISTS OF TRACTOR WASH BOOTH DRAIN, OPTIONAL LANDFILL LEACHATE WHEN RECIRCULATION IS NOT VIABLE AND

You are prohibited from discharging pollutants except in compliance with the following effluent limitations:

			EFFLUENT LIMITATIONS							
			Concentration				Mass			
Wastewater Parameter	Season	Type	7 Day Average	30 Day Average	Daily Maximum	Units	7 Day Average	30 Day Average	Daily Maximum	Units
FLOW	YEARLY	FINAL		.0450	.1350	MGD				
AMMONIA NITROGEN (N)	JAN	FINAL		41.0000	62.0000	MG/L		14.00	21.00	LBS/DAY
AMMONIA NITROGEN (N)	FEB	FINAL		41.0000	62.0000	MG/L		14.00	21.00	LBS/DAY
AMMONIA NITROGEN (N)	MAR	FINAL		15.0000	22.0000	MG/L		5.10	7.60	LBS/DAY
AMMONIA NITROGEN (N)	APR	FINAL		15.0000	22.0000	MG/L		5.10	7.60	LBS/DAY
AMMONIA NITROGEN (N)	MAY	FINAL		15.0000	22.0000	MG/L		5.10	7.60	LBS/DAY
AMMONIA NITROGEN (N)	JUN	FINAL		15.0000	22.0000	MG/L		5.10	7.60	LBS/DAY
AMMONIA NITROGEN (N)	JUL	FINAL		15.0000	22.0000	MG/L		4.90	7.40	LBS/DAY
AMMONIA NITROGEN (N)	AUG	FINAL		15.0000	22.0000	MG/L		4.90	7.40	LBS/DAY
AMMONIA NITROGEN (N)	SEP	FINAL		15.0000	22.0000	MG/L		5.10	7.60	LBS/DAY
AMMONIA NITROGEN (N)	OCT	FINAL		15.0000	22.0000	MG/L		5.10	7.60	LBS/DAY
AMMONIA NITROGEN (N)	NOV	FINAL		15.0000	22.0000	MG/L		5.10	7.60	LBS/DAY
AMMONIA NITROGEN (N)	DEC	FINAL		15.0000	22.0000	MG/L		5.10	7.60	LBS/DAY
PH (MINIMUM - MAXIMUM)	YEARLY	FINAL	6.0000		9.0000	STD UNITS				
CADMIUM,TOTAL (AS CD)	YEARLY	FINAL		.2400	.3500	MG/L		.08	.12	LBS/DAY
CHROMIUM,HEXAVALENT (AS CR)	YEARLY	FINAL		.1900	.2800	MG/L		.06	.10	LBS/DAY
COPPER,TOTAL (AS CU)	YEARLY	FINAL		.1800	.2700	MG/L		.06	.09	LBS/DAY
LEAD,TOTAL (AS PB)	YEARLY	FINAL		.6300	.9500	MG/L		.21	.32	LBS/DAY
TEMPERATURE	YEARLY	FINAL			95.0000	FARENHEIT				
ZINC,TOTAL (AS ZN)	YEARLY	FINAL		1.5000	2.3000	MG/L		.53	.80	LBS/DAY

NOTE: If seasonal limits apply, summer is from April 1 through October 31, and winter is from November 1 through March 31.

Facility Name: JOHN DEERE DUBUQUE WORKS

Permit Number: 3126107

Effluent Limitations

OUTFALL NO.: 011 WASTEWATER FROM A PHYSICAL CHEMICAL AND BIOLOGICAL TREATMENT PLANT WHICH TREATS ALL PROCESS WASTEWATER FROM THE

You are prohibited from discharging pollutants except in compliance with the following effluent limitations:

			EFFLUENT LIMITATIONS							
			Concentration				Mass			
Wastewater Parameter	Season	Type	7 Day Average	30 Day Average	Daily Maximum	Units	7 Day Average	30 Day Average	Daily Maximum	Units
FLOW	YEARLY	FINAL		.3500	.4000	MGD				
BIOCHEMICAL OXYGEN DEMAND (BOD5)	YEARLY	FINAL		30.0000	45.0000	MG/L		88.00	131.00	LBS/DAY
TOTAL SUSPENDED SOLIDS	YEARLY	FINAL		31.0000	60.0000	MG/L		91.00	175.00	LBS/DAY
PH (MINIMUM - MAXIMUM)	YEARLY	FINAL	6.0000		9.0000	STD UNITS				
CADMIUM,TOTAL (AS CD)	YEARLY	FINAL		.2600	.6900	MG/L		.76	2.01	LBS/DAY
CHROMIUM,HEXAVALENT (AS CR)	YEARLY	FINAL		.6700	1.0000	MG/L		2.30	3.40	LBS/DAY
CHROMIUM,TOTAL (AS CR)	YEARLY	FINAL		1.7100	2.7700	MG/L		5.00	8.00	LBS/DAY
COPPER,TOTAL (AS CU)	YEARLY	FINAL		.5400	.8100	MG/L		1.80	2.70	LBS/DAY
CYANIDE,TOTAL (AS CN)	YEARLY	FINAL		.4600	.7000	MG/L		1.40	2.10	LBS/DAY
LEAD,TOTAL (AS PB)	YEARLY	FINAL		.4300	.6900	MG/L		1.26	2.00	LBS/DAY
NICKEL,TOTAL (AS NI)	YEARLY	FINAL		2.3800	3.9800	MG/L		7.00	11.62	LBS/DAY
OIL AND GREASE	YEARLY	FINAL		26.0000	52.0000	MG/L		76.00	152.00	LBS/DAY
SILVER,TOTAL (AS AG)	YEARLY	FINAL		.2400	.4300	MG/L		.70	1.26	LBS/DAY
TEMPERATURE	YEARLY	FINAL			95.0000	FARENHEIT				
TOTAL TOXIC ORGANICS	YEARLY	FINAL			2.1300	MG/L			6.00	LBS/DAY
ZINC,TOTAL (AS ZN)	YEARLY	FINAL		1.4800	2.6100	MG/L		4.32	7.62	LBS/DAY

NOTE: If seasonal limits apply, summer is from April 1 through October 31, and winter is from November 1 through March 31.

Facility Name: JOHN DEERE DUBUQUE WORKS

Permit Number: 3126107

Effluent Limitations

OUTFALL NO.: 801 COMBINED DISCHARGE OF OUTFALLS 005 AND 006.

You are prohibited from discharging pollutants except in compliance with the following effluent limitations:

			EFFLUENT LIMITATIONS							
			Concentration				Mass			
Wastewater Parameter	Season	Type	7 Day Average	30 Day Average	Daily Maximum	Units	7 Day Average	30 Day Average	Daily Maximum	Units
FLOW	YEARLY	FINAL		9.5400	22.9600	MGD				
ACUTE TOXICITY, CERIODAPHNIA	YEARLY	FINAL						1.00		NON TOXIC
ACUTE TOXICITY, PIMEPHALES	YEARLY	FINAL						1.00		NON TOXIC

NOTE: If seasonal limits apply, summer is from April 1 through October 31, and winter is from November 1 through March 31.

Facility Name: JOHN DEERE DUBUQUE WORKS

Permit Number: 3126107

Non-Standard Effluent Limitations

OUTFALL NO.: 003 TREATED DOMESTIC WASTEWATER FROM AN EXTENDED AERATION TREATMENT PLANT WITH POLISHING POND.

Wastewater Parameter	Non-Standard Limits
CHLORINE,TOTAL RESIDUAL	DISCHARGE OF TOTAL RESIDUAL CHLORINE IS PROHIBITED FROM OUTFALL # 003.

Facility Name: JOHN DEERE DUBUQUE WORKS

Permit Number: 3126107

Non-Standard Effluent Limitations

OUTFALL NO.: 004 CONDENSER COOLING WATER FROM ELECTRICAL GENERATOR.

Wastewater Parameter	Non-Standard Limits
TEMPERATURE	THE MAXIMUM INCREASE IN TEMPERATURE SHALL NOT EXCEED 5.4 DEGREES C.

Non-Standard Effluent Limitations

OUTFALL NO.: 011 WASTEWATER FROM A PHYSICAL CHEMICAL AND BIOLOGICAL TREATMENT PLANT WHICH TREATS ALL PROCESS WASTEWATER FROM THE

Wastewater Parameter	Non-Standard Limits
BIOCHEMICAL OXYGEN DEMAND (BOD5)	THE BIOLOGICAL PORTION OF THE TREATMENT SYSTEM THAT CONTRIBUTES WASTEWATER TO THIS OUTFALL WAS APPROVED WITHOUT DUPLICATE UNITS, BASED ON JOHN DEERE'S ASSURANCE THAT OTHER PROCESSES INCLUDING FILTERS, STORAGE TANKS AND HAULING TO OTHER SITES ARE AVAILABLE AND WILL PROVIDE EQUIVALENT TREATMENT RELIABILITY. ACCEPTABLE RELIABILITY WILL DEPEND ON THE CONTINUED AVAILABILITY OF THOSE PROCESSES INTO THE FUTURE AND ON THE GOOD FAITH EFFORTS OF OPERATING PERSONNEL TO IMPLEMENT THEM AS NECESSARY. FAILURE OF ANY TREATMENT UNIT WILL NOT BE CONSIDERED A VAILD REASON FOR VIOLATING EFFLUENT STANDARDS.

Monitoring and Reporting Requirements

(a) Samples and measurements taken shall be representative of the volume and nature of the monitored wastewater.

(b) Analytical and sampling methods as specified in 40 CFR Part 136 or Table VII of Chapter 63 of the rules, or other methods approved in writing by the department, shall be utilized.

(c) Chapter 63 of the rules provides you with further explanation of your monitoring requirements.

(d) You are required to report all data including calculated results needed to determine compliance with the limitations contained in this permit. This includes daily maximums and minimums, 30-day averages and 7-day averages for all parameters that have concentration (mg/l) and mass (lbs/day) limits. Also, flow data shall be reported in million gallons per day (MGD).

(e) Results of all monitoring shall be recorded on forms provided by the department, and submitted to the department by the fifteenth day following the close of the reporting period. Your reporting period is on a monthly basis, ending on the last day of each month.

Outfall Number	Wastewater Parameter	Sample Frequency	Sample Type	Monitoring Location
002	FLOW	5/WEEK	24 HR TOTAL	FINAL EFFLUENT
002	PH (MINIMUM - MAXIMUM)	1/WEEK	GRAB	FINAL EFFLUENT
002	CHLORINE,TOTAL RESIDUAL	1/2 WEEKS	GRAB	FINAL EFFLUENT
002	OIL AND GREASE	1/WEEK	GRAB	FINAL EFFLUENT
002	TEMPERATURE	1/WEEK	GRAB	FINAL EFFLUENT
002	ACUTE TOXICITY, CERIODAPHNIA	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
002	ACUTE TOXICITY, PIMEPHALES	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
002	STORMWATER	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
003	FLOW	7/WEEK	24 HR TOTAL	RAW WASTE OR FINAL EFFLUENT(FLOW)
003	BIOCHEMICAL OXYGEN DEMAND (BOD5)	1/WEEK	24 HR COMP	RAW WASTE
003	BIOCHEMICAL OXYGEN DEMAND (BOD5)	1/WEEK	24 HR COMP	FINAL EFFLUENT
003	TOTAL SUSPENDED SOLIDS	1/MONTH	24 HR COMP	RAW WASTE
003	TOTAL SUSPENDED SOLIDS	1/MONTH	24 HR COMP	FINAL EFFLUENT
003	AMMONIA NITROGEN (N)	1/3 MONTH	24 HR COMP	FINAL EFFLUENT
003	PH (MINIMUM - MAXIMUM)	1/WEEK	GRAB	RAW WASTE
003	PH (MINIMUM - MAXIMUM)	1/WEEK	GRAB	FINAL EFFLUENT
003	COLIFORM,FECAL	1/3 MONTH	GRAB	EFFLUENT AFTER DISINFECTION - APRIL 1 TO OCTOBER 31 ONLY.
003	DISSOLVED OXYGEN	2/WEEK	GRAB	AERATION BASIN CONTENTS
003	SOLIDS,MIXED LIQUOR SUSPENDED	2/WEEK	GRAB	AERATION BASIN CONTENTS
003	TEMPERATURE	1/WEEK	GRAB	RAW WASTE
003	TEMPERATURE	1/WEEK	GRAB	FINAL EFFLUENT

Monitoring and Reporting Requirements

(a) Samples and measurements taken shall be representative of the volume and nature of the monitored wastewater.

(b) Analytical and sampling methods as specified in 40 CFR Part 136 or Table VII of Chapter 63 of the rules, or other methods approved in writing by the department, shall be utilized.

(c) Chapter 63 of the rules provides you with further explanation of your monitoring requirements.

(d) You are required to report all data including calculated results needed to determine compliance with the limitations contained in this permit. This includes daily maximums and minimums, 30-day averages and 7-day averages for all parameters that have concentration (mg/l) and mass (lbs/day) limits. Also, flow data shall be reported in million gallons per day (MGD).

(e) Results of all monitoring shall be recorded on forms provided by the department, and submitted to the department by the fifteenth day following the close of the reporting period. Your reporting period is on a monthly basis, ending on the last day of each month.

Outfall Number	Wastewater Parameter	Sample Frequency	Sample Type	Monitoring Location
003	TEMPERATURE	2/WEEK	GRAB	AERATION BASIN CONTENTS
003	30-MINUTE SETTLEABILITY	2/WEEK	GRAB	AERATION BASIN CONTENTS
004	FLOW	1/MONTH	24 HR TOTAL	FINAL EFFLUENT
004	PH (MINIMUM - MAXIMUM)	1/MONTH	GRAB	FINAL EFFLUENT
004	CHLORINE,TOTAL RESIDUAL	1/BATCH	GRAB	CONDENSER OUTLET #2.
004	CHLORINE,TOTAL RESIDUAL	1/BATCH	GRAB	CONDENSER OUTLET # 4.
004	TEMPERATURE	1/MONTH	GRAB	FINAL EFFLUENT
004	TEMPERATURE	1/MONTH	GRAB	RIVER INTAKE UPSTREAM OF ACTUAL INTAKE BEYOND INFLUENCE OF RE-CIRCULATED WATER.
005	FLOW	5/WEEK	24 HR TOTAL	FINAL EFFLUENT
005	PH (MINIMUM - MAXIMUM)	1/WEEK	GRAB	FINAL EFFLUENT
005	OIL AND GREASE	1/WEEK	GRAB	FINAL EFFLUENT
005	TEMPERATURE	1/WEEK	GRAB	FINAL EFFLUENT
005	STORMWATER	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
006	FLOW	5/WEEK	24 HR TOTAL	FINAL EFFLUENT
006	PH (MINIMUM - MAXIMUM)	1/WEEK	GRAB	FINAL EFFLUENT
006	OIL AND GREASE	1/WEEK	GRAB	FINAL EFFLUENT
006	TEMPERATURE	1/WEEK	GRAB	FINAL EFFLUENT
006	STORMWATER	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
008	FLOW	1/MONTH	24 HR TOTAL	FINAL EFFLUENT
008	AMMONIA NITROGEN (N)	1/3 MONTH	GRAB	FINAL EFFLUENT
008	PH (MINIMUM - MAXIMUM)	1/MONTH	GRAB	FINAL EFFLUENT

Monitoring and Reporting Requirements

(a) Samples and measurements taken shall be representative of the volume and nature of the monitored wastewater.

(b) Analytical and sampling methods as specified in 40 CFR Part 136 or Table VII of Chapter 63 of the rules, or other methods approved in writing by the department, shall be utilized.

(c) Chapter 63 of the rules provides you with further explanation of your monitoring requirements.

(d) You are required to report all data including calculated results needed to determine compliance with the limitations contained in this permit. This includes daily maximums and minimums, 30-day averages and 7-day averages for all parameters that have concentration (mg/l) and mass (lbs/day) limits. Also, flow data shall be reported in million gallons per day (MGD).

(e) Results of all monitoring shall be recorded on forms provided by the department, and submitted to the department by the fifteenth day following the close of the reporting period. Your reporting period is on a monthly basis, ending on the last day of each month.

Outfall Number	Wastewater Parameter	Sample Frequency	Sample Type	Monitoring Location
008	CADMIUM,TOTAL (AS CD)	1/MONTH	GRAB	FINAL EFFLUENT
008	CHROMIUM,HEXAVALENT (AS CR)	1/MONTH	GRAB	FINAL EFFLUENT
008	COPPER,TOTAL (AS CU)	1/MONTH	GRAB	FINAL EFFLUENT
008	LEAD,TOTAL (AS PB)	1/MONTH	GRAB	FINAL EFFLUENT
008	TEMPERATURE	1/MONTH	GRAB	FINAL EFFLUENT
008	ZINC,TOTAL (AS ZN)	1/MONTH	GRAB	FINAL EFFLUENT
008	STORMWATER	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
009	STORMWATER	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
010	STORMWATER	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
011	FLOW	7/WEEK	24 HR TOTAL	FINAL EFFLUENT
011	BIOCHEMICAL OXYGEN DEMAND (BOD5)	2/WEEK	24 HR COMP	FINAL EFFLUENT
011	TOTAL SUSPENDED SOLIDS	2/WEEK	24 HR COMP	FINAL EFFLUENT
011	PH (MINIMUM - MAXIMUM)	2/WEEK	GRAB	FINAL EFFLUENT
011	CADMIUM,TOTAL (AS CD)	2/WEEK	24 HR COMP	FINAL EFFLUENT
011	CHROMIUM,HEXAVALENT (AS CR)	2/WEEK	24 HR COMP	FINAL EFFLUENT
011	CHROMIUM,TOTAL (AS CR)	2/WEEK	24 HR COMP	FINAL EFFLUENT
011	COPPER,TOTAL (AS CU)	2/WEEK	24 HR COMP	FINAL EFFLUENT
011	CYANIDE,TOTAL (AS CN)	1/6 MONTH	GRAB	FINAL EFFLUENT
011	LEAD,TOTAL (AS PB)	2/WEEK	24 HR COMP	FINAL EFFLUENT
011	NICKEL,TOTAL (AS NI)	2/WEEK	24 HR COMP	FINAL EFFLUENT
011	OIL AND GREASE	2/WEEK	GRAB	FINAL EFFLUENT

Monitoring and Reporting Requirements

(a) Samples and measurements taken shall be representative of the volume and nature of the monitored wastewater.

(b) Analytical and sampling methods as specified in 40 CFR Part 136 or Table VII of Chapter 63 of the rules, or other methods approved in writing by the department, shall be utilized.

(c) Chapter 63 of the rules provides you with further explanation of your monitoring requirements.

(d) You are required to report all data including calculated results needed to determine compliance with the limitations contained in this permit. This includes daily maximums and minimums, 30-day averages and 7-day averages for all parameters that have concentration (mg/l) and mass (lbs/day) limits. Also, flow data shall be reported in million gallons per day (MGD).

(e) Results of all monitoring shall be recorded on forms provided by the department, and submitted to the department by the fifteenth day following the close of the reporting period. Your reporting period is on a monthly basis, ending on the last day of each month.

Outfall Number	Wastewater Parameter	Sample Frequency	Sample Type	Monitoring Location
011	SILVER,TOTAL (AS AG)	1/6 MONTH	24 HR COMP	FINAL EFFLUENT
011	TEMPERATURE	2/WEEK	GRAB	FINAL EFFLUENT
011	TOTAL TOXIC ORGANICS	1/6 MONTH	GRAB	FINAL EFFLUENT
011	ZINC,TOTAL (AS ZN)	2/WEEK	24 HR COMP	FINAL EFFLUENT
011	BENZENE	1/6 MONTH	GRAB	FINAL EFFLUENT
011	ETHYLBENZENE	1/6 MONTH	GRAB	FINAL EFFLUENT
011	TRICHLORDETHANE	1/6 MONTH	GRAB	FINAL EFFLUENT
011	1,1-DICHLORDETHENE	1/6 MONTH	GRAB	FINAL EFFLUENT
011	1,1-DICHLORDETHANE	1/6 MONTH	GRAB	FINAL EFFLUENT
011	1,2-DICHLORDETHENE	1/6 MONTH	GRAB	FINAL EFFLUENT
011	CHLOROFORM	1/6 MONTH	GRAB	FINAL EFFLUENT
011	1,1,1-TRICHLORDETHANE(METHYL CHLOROFOR	1/6 MONTH	GRAB	FINAL EFFLUENT
011	CARBON TETRACHLORIDE	1/6 MONTH	GRAB	FINAL EFFLUENT
011	1,1,2,2,-TETRACHLORDETHANE	1/6 MONTH	GRAB	FINAL EFFLUENT
011	TRICHLORDETHENE	1/6 MONTH	GRAB	FINAL EFFLUENT
011	TETRACHLORDETHENE	1/6 MONTH	GRAB	FINAL EFFLUENT
011	TOLUENE	1/6 MONTH	GRAB	FINAL EFFLUENT
011	XYLENE	1/6 MONTH	GRAB	FINAL EFFLUENT
014	STORMWATER	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
015	STORMWATER	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
016	STORMWATER	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT

Monitoring and Reporting Requirements

(a) Samples and measurements taken shall be representative of the volume and nature of the monitored wastewater.

(b) Analytical and sampling methods as specified in 40 CFR Part 136 or Table VII of Chapter 63 of the rules, or other methods approved in writing by the department, shall be utilized.

(c) Chapter 63 of the rules provides you with further explanation of your monitoring requirements.

(d) You are required to report all data including calculated results needed to determine compliance with the limitations contained in this permit. This includes daily maximums and minimums, 30-day averages and 7-day averages for all parameters that have concentration (mg/l) and mass (lbs/day) limits. Also, flow data shall be reported in million gallons per day (MGD).

(e) Results of all monitoring shall be recorded on forms provided by the department, and submitted to the department by the fifteenth day following the close of the reporting period. Your reporting period is on a monthly basis, ending on the last day of each month.

Outfall Number	Wastewater Parameter	Sample Frequency	Sample Type	Monitoring Location
017	STORMWATER	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
018	STORMWATER	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
019	STORMWATER	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
020	STORMWATER	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
021	STORMWATER	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
022	STORMWATER	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
023	STORMWATER	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
024	STORMWATER	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
025	STORMWATER	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
026	STORMWATER	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
027	STORMWATER	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
028	STORMWATER	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
801	FLOW	5/WEEK	24 HR TOTAL	FINAL EFFLUENT
801	ACUTE TOXICITY, CERIODAPHNIA	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
801	ACUTE TOXICITY, PIMEPHALES	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT

Permit Number: 3126107 Special Monitoring Requirements

Outfall Number	Description
002	STORMWATER

SEE THE ATTACHED "STORM WATER DISCHARGE REQUIREMENTS" FOR OUTFALL APPLICABILITY AND MONITORING PARAMETERS. WHERE AN OUTFALL REQUIRES STORMWATER MONITORING, THE MONITORING SHALL BE CONDUCTED AT THE FREQUENCY AND LOCATION SPECIFIED BY THE "MONITORING AND REPORTING REQUIREMENTS". THE PERMITTED OUTFALLS WHICH MUST BE EVALUATED FOR MONITORING APPLICABILITY UNDER THE "STORMWATER DISCHARGE REQUIREMENTS" ARE AS FOLLOW:
002, 005, 006, 008, 009, 010, 014, 015, 016, 017, 018, 019, 020, 021, 022, 023, 024, 025, 026, 027, AND 028.

004 CHLORINE,TOTAL RESIDUAL

SAMPLES SHALL BE COLLECTED AT THE CONDENSER DISCHARGE BEFORE MIXING WITH OTHER WASTESTREAMS. SAMPLES NEED TO BE COLLECTED ONLY ON DAYS THAT THE CONDENSER IS CHLORINATED.

---

011 TOTAL TOXIC ORGANICS

TOTAL TOXIC ORGANICS POLLUTANTS SHALL BE LIMITED ONLY TO THE FOLLOWING PARAMETERS:

1,1 DCE	1,1,2-TRICHLOROETHANE
1,1 DCA	BENZENE
T-1,2-DCE	TETRACHLOROETHENE
CHLOROFORM	1,1,2,2-TETRACHLOROETHANE
1,1,1-TCA	TOLUENE
CARBON TET.	ETHYLBENZENE
TCE	XYLENE

FACILITY NAME: JOHN DEERE DUBUQUE WORKS

PERMIT NUMBER: 31-26-1-07

OUTFALL NUMBER: 002

Ceriodaphnia and Pimephales Toxicity Effluent Testing

1. The initial Toxicity Test shall be conducted within three (3) months of permit issuance.

2. Effluent toxicity testing procedures used to demonstrate compliance with permit limits shall be those listed in the Standard Operating Procedure: Effluent Toxicity Testing, Iowa Department of Natural Resources, March 1991, and Chapters 567-60.2 and 567-63.4(2), Iowa Administrative Code.

3. The diluted effluent sample must contain a minimum of 92.1% effluent and no more than 7.9% of dilution water.

4. One valid positive toxicity result will require quarterly testing for effluent toxicity.

5. Two successive valid positive toxicity results or three positive results out of five successive valid effluent toxicity tests will require a toxic reduction evaluation to be completed to eliminate the toxicity.

6. A non-toxic test result shall be indicated as a "1" on the monthly operation report. A toxic test result shall be indicated as a "2" on the monthly operation report. DNR Form 542-1381 shall also be submitted to the DNR field office along with the monthly operation report.

Ceriodaphnia and Pimephales Toxicity Effluent Limits

The 30 day average mass limit of "1" for the parameters Acute Toxicity, Ceriodaphnia and Acute Toxicity, Pimephales means no positive toxicity results.

Definition: "Positive toxicity result" means a statistical difference of mortality rate between the control and the diluted effluent sample. For more information see the Standard Operating Procedure: Effluent Toxicity Testing, Iowa Department of Natural Resources and Chapters 567-60.2 and 567-63.4, Iowa Administrative Code.

Revised: March 2, 1993 cwf

FACILITY NAME: JOHN DEERE DUBUQUE WORKS

PERMIT NUMBER: 31-26-1-07

OUTFALL NUMBER: 801

Ceriodaphnia and Pimephales Toxicity Effluent Testing

1. The initial Toxicity Test shall be conducted within three (3) months of permit issuance.

2. Effluent toxicity testing procedures used to demonstrate compliance with permit limits shall be those listed in the Standard Operating Procedure: Effluent Toxicity Testing, Iowa Department of Natural Resources, March 1991, and Chapters 567-60.2 and 567-63.4(2), Iowa Administrative Code.

3. The diluted effluent sample must contain a minimum of 79% effluent and no more than 21% of dilution water.

4. One valid positive toxicity result will require quarterly testing for effluent toxicity.

5. Two successive valid positive toxicity results or three positive results out of five successive valid effluent toxicity tests will require a toxic reduction evaluation to be completed to eliminate the toxicity.

6. A non-toxic test result shall be indicated as a "1" on the monthly operation report. A toxic test result shall be indicated as a "2" on the monthly operation report. DNR Form 542-1381 shall also be submitted to the DNR field office along with the monthly operation report.

Ceriodaphnia and Pimephales Toxicity Effluent Limits

The 30 day average mass limit of "1" for the parameters Acute Toxicity, Ceriodaphnia and Acute Toxicity, Pimephales means no positive toxicity results.

Definition: "Positive toxicity result" means a statistical difference of mortality rate between the control and the diluted effluent sample. For more information see the Standard Operating Procedure: Effluent Toxicity Testing, Iowa Department of Natural Resources and Chapters 567-60.2 and 567-63.4, Iowa Administrative Code.

Revised: March 2, 1993 cwf

IOWA DEPARTMENT OF NATURAL RESOURCES
NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

NPDES PERMIT

PERMITTEE

John Deere Dubuque Works
18600 South John Deere Road
P.O. Box 538
Dubuque, Iowa 52004

IDENTITY AND LOCATION OF FACILITY

John Deere Dubuque Works
Section 35, T-90N, R-2E
Dubuque County, Iowa

IOWA NPDES PERMIT NUMBER: 31-26-1-07

RECEIVING WATERCOURSE

Little Maquoketa and Mississippi Rivers

DATE OF ISSUANCE: July 15, 1999

DATE OF EXPIRATION: July 14, 2004

YOU ARE REQUIRED TO FILE FOR
RENEWAL OF THIS PERMIT BY: January 14, 2004

EPA NUMBER - IA 0000051

This permit is issued pursuant to the authority of section 402(b) of the Clean Water Act (33 U.S.C. 1342(b)), Iowa Code section 455B.174, and rule 567--64.3, Iowa Administrative Code. You are authorized to operate the disposal system and to discharge the pollutants specified in this permit in accordance with the effluent limitations, monitoring requirements and other terms set forth in this permit.

You may appeal any conditions of this permit by filing written notice of appeal and request for administrative hearing with the director of this department within 30 days of receipt of this permit.

Any existing, unexpired Iowa operation permit of Iowa NPDES permit previously issued by the department for the facility identified above is revoked by the issuance of this Iowa NPDES operation permit.

FOR THE DEPARTMENT OF NATURAL RESOURCES

Paul W. Johnson, Director

By _____
WAYNE FARRAND, Supervisor
Wastewater Section
ENVIRONMENTAL PROTECTION DIVISION

Outfall Number	Description
001	Old foundry area storm water only discharge
002	Non-contact cooling water, drinking fountain drains and storm water discharge through the north sedimentation pond which is equipped with an oil skimmer.
003	Treated domestic wastewater from an extended aeration treatment plant with polishing pond.
004	Condenser cooling water from electrical generator.
005	Non-contact cooling water, drinking fountain drains and storm water discharge through the south sedimentation pond which is equipped with an oil skimmer.
006	Stormwater discharge from Buildings W-3,4,5 and C-26,27 through the new sedimentation pond which is equipped with an oil skimmer.
008	Discharge consists of tractor wash booth drain, optional landfill leachate when recirculation is not viable and storm water discharge thru a sedimentation pond
009	Building Y storm water only discharge.
010	Drinking fountain drains and Building W-6 storm water discharge.
011	Wastewater from a physical chemical and biological treatment plant which treats all process wastewater from the facility.
012	Lot-A storm water only discharge.
013	West foundry area storm water only discharge.
014	North end area storm water only discharge from a pallet reclaim and scrap salvage area.
015	North V-1 storm water only discharge from a parts storage yard.
016	North Y-lot area storm water only discharge from a tractor storage yard.
017	Ringle yard area storm water only discharge from a tractor storage and shipping yard.
018	Center Y-lot storm water only discharge from a tractor storage yard.
019	South Y-lot storm water only discharge from a tractor storage yard.
020	South truck gate storm water only discharge from vehicle parking areas.
021	Building x-16 storm water only discharge.
022	Landfill ravine storm water only discharge.
023	Gottschalk ravine storm water only discharge from a natural ravine.
024	Site 4 test area stormwater only discharge.
025	NW corner property storm water only discharge
026	Guler ravine storm water only discharge.
027	X-18 access road storm water only discharge.
028	Dirt draw bar area storm water only discharge.
801	Combined discharge of outfalls 005 and 006.

Permit Number: 3126107

Effluent Limitations

OUTFALL NO.: 002 NON-CONTACT COOLING WATER, DRINKING FOUNTAIN DRAINS AND STORM WATER DISCHARGE THROUGH THE NORTH SEDIMENTATION PO

You are prohibited from discharging pollutants except in compliance with the following effluent limitations:

			EFFLUENT LIMITATIONS							
			Concentration				Mass			
Wastewater Parameter	Season	Type	7 Day Average	30 Day Average	Daily Maximum	Units	7 Day Average	30 Day Average	Daily Maximum	Units
FLOW	YEARLY	FINAL		3.5000	6.4000	MGD				
PH (MINIMUM - MAXIMUM)	YEARLY	FINAL	6.0000		9.0000	STD UNITS				
CHLORINE,TOTAL RESIDUAL	YEARLY	FINAL		.0500	.0760	MG/L		1.50	2.20	LBS/DAY
OIL AND GREASE	YEARLY	FINAL		10.0000	15.0000	MG/L		258.00	517.00	LBS/DAY
ACUTE TOXICITY, CERIODAPHNIA	YEARLY	FINAL						1.00		NON TOXIC
ACUTE TOXICITY, PIMEPHALES	YEARLY	FINAL						1.00		NON TOXIC

NOTE: If seasonal limits apply, summer is from April 1 through October 31, and winter is from November 1 through March 31.

Facility Name: John Deere Dubuque Works
Permit Number: 31-26-1-07

EFFLUENT LIMITATIONS

Outfall No.: 003
Treated domestic wastewater from an extended aeration treatment plant with polishing pond.

You are prohibited from discharging pollutants except in compliance with the following effluent limitations:

Wastewater Parameter	Season	Type	30-day Avg mg/l	Daily Max mg/l	30-day Avg lbs/day	Daily Max lbs/day
Flow (mgd)	Yearly	Final	0.20	0.24	-	-
$CBOD_5$	Yearly	Final	30.0	45.0	50.0	75.0
TSS	Yearly	Final	30.0	45.0	50.0	75.0
Coliform, Fecal *	Seasonal	Final	-	20,700 Organisms/100 ml	-	-
pH (Min. - Max.)	Yearly	Final	6.0	9.0	STD UNITS	-

* Limits apply from April 1 through October 31

The discharge of total residual chlorine is prohibited. If chlorine is added to the discharge the concentration shall not exceed method detection limits using the EPA approved method with the lowest detection limit.

Facility Name: John Deere Dubuque Works
Permit Number: 31-26-1-07

EFFLUENT LIMITATIONS

Outfall No.: 004 Condenser cooling water from electrical generator

You are prohibited from discharging pollutants except in compliance with the following effluent limitations:

Wastewater Parameter	Season	Type	30-day Average	Daily Maximum	30-day Avg lbs/day	Daily Max lbs/day
Flow	Yearly	Final	21.5 mgd	23.0 mgd	-	-
Chlorine, Total Residual	Yearly	Final	-	0.20 mg/l	-	-
pH (minimum-maximum)	Yearly	Final	6.0 Std Units	10.0 Std Units	-	-
*Temperature	Yearly	Final	-	5.4° Fahrenheit		-

* See Page 19

Effluent Limitations

OUTFALL NO.: 005 NON-CONTACT COOLING WATER, DRINKING FOUNTAIN DRAINS AND STORM WATER DISCHARGE THROUGH THE SOUTH SEDIMENTATION PO

You are prohibited from discharging pollutants except in compliance with the following effluent limitations:

			EFFLUENT LIMITATIONS							
			Concentration				Mass			
Wastewater Parameter	Season	Type	7 Day Average	30 Day Average	Daily Maximum	Units	7 Day Average	30 Day Average	Daily Maximum	Units
PH (MINIMUM - MAXIMUM)	YEARLY	FINAL	6.0000		9.0000	STD UNITS				
OIL AND GREASE	YEARLY	FINAL		10.0000	15.0000	MG/L				

NOTE: If seasonal limits apply, summer is from April 1 through October 31, and winter is from November 1 through March 31.

Effluent Limitations

Permit Number: 3126107

OUTFALL NO.: 006 STORMWATER DISCHARGE FROM BUILDINGS W-3,4,5 AND C-26,27 THROUGH THE NEW SEDIMENTATION POND WHICH IS EQUIPPED WIT

You are prohibited from discharging pollutants except in compliance with the following effluent limitations:

Wastewater Parameter	Season	Type	EFFLUENT LIMITATIONS							
			Concentration				Mass			
			7 Day Average	30 Day Average	Daily Maximum	Units	7 Day Average	30 Day Average	Daily Maximum	Units
PH (MINIMUM - MAXIMUM)	YEARLY	FINAL	6.0000		9.0000	STD UNITS				
OIL AND GREASE	YEARLY	FINAL		10.0000	15.0000	MG/L				

NOTE: If seasonal limits apply, summer is from April 1 through October 31, and winter is from November 1 through March 31.

Effluent Limitations

Permit Number: 3126107

OUTFALL NO.: 008 DISCHARGE CONSISTS OF TRACTOR WASH BOOTH DRAIN, OPTIONAL LANDFILL LEACHATE WHEN RECIRCULATION IS NOT VIABLE AND

You are prohibited from discharging pollutants except in compliance with the following effluent limitations:

			EFFLUENT LIMITATIONS							
			Concentration				Mass			
Wastewater Parameter	Season	Type	7 Day Average	30 Day Average	Daily Maximum	Units	7 Day Average	30 Day Average	Daily Maximum	Units
FLOW	YEARLY	FINAL		.0500	.2280	MGD				
AMMONIA NITROGEN (N)	JAN	FINAL		29.0000	43.0000	MG/L		22.00	33.00	LBS/DAY
AMMONIA NITROGEN (N)	FEB	FINAL		29.0000	43.0000	MG/L		22.00	33.00	LBS/DAY
AMMONIA NITROGEN (N)	MAR	FINAL		11.0000	16.0000	MG/L		9.00	13.00	LBS/DAY
AMMONIA NITROGEN (N)	APR	FINAL		11.0000	16.0000	MG/L		9.00	13.00	LBS/DAY
AMMONIA NITROGEN (N)	MAY	FINAL		11.0000	16.0000	MG/L		9.00	13.00	LBS/DAY
AMMONIA NITROGEN (N)	JUN	FINAL		15.0000	22.0000	MG/L		5.10	7.60	LBS/DAY
AMMONIA NITROGEN (N)	JUL	FINAL		10.0000	15.0000	MG/L		9.00	13.00	LBS/DAY
AMMONIA NITROGEN (N)	AUG	FINAL		10.0000	15.0000	MG/L		9.00	13.00	LBS/DAY
AMMONIA NITROGEN (N)	SEP	FINAL		11.0000	16.0000	MG/L		9.00	13.00	LBS/DAY
AMMONIA NITROGEN (N)	OCT	FINAL		11.0000	16.0000	MG/L		9.00	13.00	LBS/DAY
AMMONIA NITROGEN (N)	NOV	FINAL		11.0000	16.0000	MG/L		9.00	13.00	LBS/DAY
AMMONIA NITROGEN (N)	DEC	FINAL		11.0000	16.0000	MG/L		9.00	13.00	LBS/DAY
PH (MINIMUM - MAXIMUM)	YEARLY	FINAL	6.0000		9.0000	STD UNITS				
CADMIUM,TOTAL (AS CD)	YEARLY	FINAL		.0870	.1300	MG/L		.12	.18	LBS/DAY
CHROMIUM,TOTAL (AS CR)	YEARLY	FINAL		.1400	.2000	MG/L		.12	.17	LBS/DAY
COPPER,TOTAL (AS CU)	YEARLY	FINAL		.1300	.1900	MG/L		.11	.17	LBS/DAY
LEAD,TOTAL (AS PB)	YEARLY	FINAL		.4500	.6800	MG/L		.24	.36	LBS/DAY
ZINC,TOTAL (AS ZN)	YEARLY	FINAL		1.1300	1.7000	MG/L		.97	1.45	LBS/DAY

NOTE: If seasonal limits apply, summer is from April 1 through October 31, and winter is from November 1 through March 31.

Effluent Limitations

Permit Number: 3126107

OUTFALL NO.: 011 WASTEWATER FROM A PHYSICAL CHEMICAL AND BIOLOGICAL TREATMENT PLANT WHICH TREATS ALL PROCESS WASTEWATER FROM THE

You are prohibited from discharging pollutants except in compliance with the following effluent limitations:

			EFFLUENT LIMITATIONS							
			Concentration				Mass			
Wastewater Parameter	Season	Type	7 Day Average	30 Day Average	Daily Maximum	Units	7 Day Average	30 Day Average	Daily Maximum	Units
FLOW	YEARLY	FINAL		.3500	.4000	MGD				
BIOCHEMICAL OXYGEN DEMAND (BOD5)	YEARLY	FINAL		30.0000	45.0000	MG/L		88.00	131.00	LBS/DAY
TOTAL SUSPENDED SOLIDS	YEARLY	FINAL		31.0000	60.0000	MG/L		91.00	175.00	LBS/DAY
PH (MINIMUM - MAXIMUM)	YEARLY	FINAL	6.0000		9.0000	STD UNITS				
CADMIUM,TOTAL (AS CD)	YEARLY	FINAL		.2600	.6900	MG/L		.76	2.01	LBS/DAY
CHROMIUM,TOTAL (AS CR)	YEARLY	FINAL		1.7100	2.7700	MG/L		5.00	8.00	LBS/DAY
COPPER,TOTAL (AS CU)	YEARLY	FINAL		.5400	.8100	MG/L		1.80	2.70	LBS/DAY
CYANIDE,TOTAL (AS CN)	YEARLY	FINAL		.4600	.7000	MG/L		1.40	2.10	LBS/DAY
LEAD,TOTAL (AS PB)	YEARLY	FINAL		.4300	.6900	MG/L		1.26	2.00	LBS/DAY
NICKEL,TOTAL (AS NI)	YEARLY	FINAL		2.3800	3.9800	MG/L		7.00	11.62	LBS/DAY
OIL AND GREASE	YEARLY	FINAL		26.0000	52.0000	MG/L		76.00	152.00	LBS/DAY
SILVER,TOTAL (AS AG)	YEARLY	FINAL		.2400	.4300	MG/L		.70	1.26	LBS/DAY
TOTAL TOXIC ORGANICS	YEARLY	FINAL			2.1300	MG/L				
ZINC,TOTAL (AS ZN)	YEARLY	FINAL		1.4800	2.6100	MG/L		4.32	7.62	LBS/DAY

NOTE: If seasonal limits apply, summer is from April 1 through October 31, and winter is from November 1 through March 31.

Effluent Limitations

Permit Number: 3126107

OUTFALL NO.: 801 COMBINED DISCHARGE OF OUTFALLS 005 AND 006.

You are prohibited from discharging pollutants except in compliance with the following effluent limitations:

Wastewater Parameter	Season	Type	EFFLUENT LIMITATIONS							
			Concentration				Mass			
			7 Day Average	30 Day Average	Daily Maximum	Units	7 Day Average	30 Day Average	Daily Maximum	Units
FLOW	YEARLY	FINAL		9.5400	22.9600	MGD				
ACUTE TOXICITY, CERIODAPHNIA	YEARLY	FINAL						1.00		NON TOXIC
ACUTE TOXICITY, PIMEPHALES	YEARLY	FINAL						1.00		NON TOXIC

NOTE: If seasonal limits apply, summer is from April 1 through October 31, and winter is from November 1 through March 31.

Monitoring and Reporting Requirements

(a) Samples and measurements taken shall be representative of the volume and nature of the monitored wastewater.

(b) Analytical and sampling methods as specified in 40 CFR Part 136 or other methods approved in writing by the department, shall be utilized.

(c) Chapter 63 of the rules provides you with further explanation of your monitoring requirements.

(d) You are required to report all data including calculated results needed to determine compliance with the limitations contained in this permit. This includes daily maximums and minimums, 30-day averages and 7-day averages for all parameters that have concentration (mg/l) and mass (lbs/day) limits. Also, flow data shall be reported in million gallons per day (MGD).

(e) Results of all monitoring shall be recorded on forms provided by the department, and submitted to the department by the fifteenth day following the close of the reporting period. Your reporting period is on a monthly basis, ending on the last day of each month.

Outfall Number	Wastewater Parameter	Sample Frequency	Sample Type	Monitoring Location
002	FLOW	5/WEEK	24 HR TOTAL	FINAL EFFLUENT
002	PH (MINIMUM - MAXIMUM)	1/WEEK	GRAB	FINAL EFFLUENT
002	CHLORINE,TOTAL RESIDUAL	1/2 WEEKS	GRAB	FINAL EFFLUENT
002	OIL AND GREASE	1/WEEK	GRAB	FINAL EFFLUENT
002	TEMPERATURE	1/WEEK	GRAB	FINAL EFFLUENT
002	ACUTE TOXICITY, CERIODAPHNIA	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
002	ACUTE TOXICITY, PIMEPHALES	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
003	BIOCHEMICAL OXYGEN DEMAND (BOD5)	1/WEEK	24 HR COMP	RAW WASTE
003	TOTAL SUSPENDED SOLIDS	1/MONTH	24 HR COMP	RAW WASTE
003	PH (MINIMUM - MAXIMUM)	1/WEEK	GRAB	RAW WASTE
003	FLOW	7/WEEK	24 HR TOTAL	RAW WASTE OR FINAL EFFLUENT(FLOW)
003	BIOCHEMICAL OXYGEN DEMAND (BOD5)	1/WEEK	24 HR COMP	FINAL EFFLUENT
003	TOTAL SUSPENDED SOLIDS	1/MONTH	24 HR COMP	FINAL EFFLUENT
003	AMMONIA NITROGEN (N)	1/3 MONTH	24 HR COMP	FINAL EFFLUENT
003	PH (MINIMUM - MAXIMUM)	1/WEEK	GRAB	FINAL EFFLUENT
003	TEMPERATURE	1/WEEK	GRAB	FINAL EFFLUENT
003	COLIFORM,FECAL	1/3 MONTH	GRAB	EFFLUENT AFTER DISINFECTION - APRIL 1 THROUGH OCTOBER 31
003	DISSOLVED OXYGEN (MINIMUM)	2/WEEK	GRAB	AERATION BASIN CONTENTS
003	SOLIDS,MIXED LIQUOR SUSPENDED	2/WEEK	GRAB	AERATION BASIN CONTENTS
003	TEMPERATURE	2/WEEK	GRAB	AERATION BASIN CONTENTS
003	30-MINUTE SETTLEABILITY	2/WEEK	GRAB	AERATION BASIN CONTENTS

Monitoring and Reporting Requirements

(a) Samples and measurements taken shall be representative of the volume and nature of the monitored wastewater.

(b) Analytical and sampling methods as specified in 40 CFR Part 136 or other methods approved in writing by the department, shall be utilized.

(c) Chapter 63 of the rules provides you with further explanation of your monitoring requirements.

(d) You are required to report all data including calculated results needed to determine compliance with the limitations contained in this permit. This includes daily maximums and minimums, 30-day averages and 7-day averages for all parameters that have concentration (mg/l) and mass (lbs/day) limits. Also, flow data shall be reported in million gallons per day (MGD).

(e) Results of all monitoring shall be recorded on forms provided by the department, and submitted to the department by the fifteenth day following the close of the reporting period. Your reporting period is on a monthly basis, ending on the last day of each month.

Outfall Number	Wastewater Parameter	Sample Frequency	Sample Type	Monitoring Location
004	FLOW	1/MONTH	24 HR TOTAL	FINAL EFFLUENT
004	PH (MINIMUM - MAXIMUM)	1/MONTH	GRAB	FINAL EFFLUENT
004	TEMPERATURE	1/MONTH	GRAB	FINAL EFFLUENT
004	TEMPERATURE	1/MONTH	GRAB	RIVER INTAKE UPSTREAM OF ACTUAL INTAKE BEYOND INFLUENCE OF RE-CIRCULATED WATER
004	CHLORINE,TOTAL RESIDUAL	1/BATCH	GRAB	CONDENSER OUTLET #2
004	CHLORINE,TOTAL RESIDUAL	1/BATCH	GRAB	CONDENSER OUTLET #4
005	PH (MINIMUM - MAXIMUM)	1/WEEK	GRAB	FINAL EFFLUENT
005	OIL AND GREASE	1/WEEK	GRAB	FINAL EFFLUENT
005	TEMPERATURE	1/WEEK	GRAB	FINAL EFFLUENT
006	PH (MINIMUM - MAXIMUM)	1/WEEK	GRAB	FINAL EFFLUENT
006	OIL AND GREASE	1/WEEK	GRAB	FINAL EFFLUENT
006	TEMPERATURE	1/WEEK	GRAB	FINAL EFFLUENT
008	FLOW	1/WEEK	24 HR TOTAL	FINAL EFFLUENT
008	AMMONIA NITROGEN (N)	1/3 MONTH	GRAB	FINAL EFFLUENT
008	PH (MINIMUM - MAXIMUM)	1/MONTH	GRAB	FINAL EFFLUENT
008	CADMIUM,TOTAL (AS CD)	1/MONTH	GRAB	FINAL EFFLUENT
008	CHROMIUM,TOTAL (AS CR)	1/MONTH	GRAB	FINAL EFFLUENT
008	COPPER,TOTAL (AS CU)	1/MONTH	GRAB	FINAL EFFLUENT
008	LEAD,TOTAL (AS PB)	1/MONTH	GRAB	FINAL EFFLUENT
008	TEMPERATURE	1/MONTH	GRAB	FINAL EFFLUENT
008	ZINC,TOTAL (AS ZN)	1/MONTH	GRAB	FINAL EFFLUENT

Monitoring and Reporting Requirements

(a) Samples and measurements taken shall be representative of the volume and nature of the monitored wastewater.

(b) Analytical and sampling methods as specified in 40 CFR Part 136 or other methods approved in writing by the department, shall be utilized.

(c) Chapter 63 of the rules provides you with further explanation of your monitoring requirements.

(d) You are required to report all data including calculated results needed to determine compliance with the limitations contained in this permit. This includes daily maximums and minimums, 30-day averages and 7-day averages for all parameters that have concentration (mg/l) and mass (lbs/day) limits. Also, flow data shall be reported in million gallons per day (MGD).

(e) Results of all monitoring shall be recorded on forms provided by the department, and submitted to the department by the fifteenth day following the close of the reporting period. Your reporting period is on a monthly basis, ending on the last day of each month.

Outfall Number	Wastewater Parameter	Sample Frequency	Sample Type	Monitoring Location
009	STORMWATER	1/3 MONTH	VISUAL	SEE PAGE 7 OF STORM WATER REQUIREMENTS
010	STORMWATER	1/3 MONTH	VISUAL	SEE PAGE 7 OF STORM WATER REQUIREMENTS
011	FLOW	7/WEEK	24 HR TOTAL	FINAL EFFLUENT
011	BIOCHEMICAL OXYGEN DEMAND (BOD5)	2/WEEK	24 HR COMP	FINAL EFFLUENT
011	TOTAL SUSPENDED SOLIDS	2/WEEK	24 HR COMP	FINAL EFFLUENT
011	PH (MINIMUM - MAXIMUM)	2/WEEK	GRAB	FINAL EFFLUENT
011	CADMIUM,TOTAL (AS CD)	1/3 MONTH	24 HR COMP	FINAL EFFLUENT
011	CHROMIUM,TOTAL (AS CR)	1/3 MONTH	24 HR COMP	FINAL EFFLUENT
011	COPPER,TOTAL (AS CU)	1/3 MONTH	24 HR COMP	FINAL EFFLUENT
011	CYANIDE,TOTAL (AS CN)	1/6 MONTH	GRAB	FINAL EFFLUENT
011	LEAD,TOTAL (AS PB)	1/3 MONTH	24 HR COMP	FINAL EFFLUENT
011	NICKEL,TOTAL (AS NI)	1/3 MONTH	24 HR COMP	FINAL EFFLUENT
011	OIL AND GREASE	2/WEEK	GRAB	FINAL EFFLUENT
011	SILVER,TOTAL (AS AG)	1/6 MONTH	24 HR COMP	FINAL EFFLUENT
011	TEMPERATURE	2/WEEK	GRAB	FINAL EFFLUENT
011	TOTAL TOXIC ORGANICS	1/6 MONTH	GRAB	FINAL EFFLUENT
011	ZINC,TOTAL (AS ZN)	1/3 MONTH	24 HR COMP	FINAL EFFLUENT
011	BENZENE	1/6 MONTH	GRAB	FINAL EFFLUENT
011	ETHYLBENZENE	1/6 MONTH	GRAB	FINAL EFFLUENT
011	TRICHLOROETHANE	1/6 MONTH	GRAB	FINAL EFFLUENT
011	1,1-DICHLOROETHENE	1/6 MONTH	GRAB	FINAL EFFLUENT

Monitoring and Reporting Requirements

(a) Samples and measurements taken shall be representative of the volume and nature of the monitored wastewater.

(b) Analytical and sampling methods as specified in 40 CFR Part 136 or other methods approved in writing by the department, shall be utilized.

(c) Chapter 63 of the rules provides you with further explanation of your monitoring requirements.

(d) You are required to report all data including calculated results needed to determine compliance with the limitations contained in this permit. This includes daily maximums and minimums, 30-day averages and 7-day averages for all parameters that have concentration (mg/l) and mass (lbs/day) limits. Also, flow data shall be reported in million gallons per day (MGD).

(e) Results of all monitoring shall be recorded on forms provided by the department, and submitted to the department by the fifteenth day following the close of the reporting period. Your reporting period is on a monthly basis, ending on the last day of each month.

Outfall Number	Wastewater Parameter	Sample Frequency	Sample Type	Monitoring Location
011	1,1-DICHLOROETHANE	1/6 MONTH	GRAB	FINAL EFFLUENT
011	1,2-DICHLOROETHENE	1/6 MONTH	GRAB	FINAL EFFLUENT
011	CHLOROFORM	1/6 MONTH	GRAB	FINAL EFFLUENT
011	1,1,1-TRICHLOROETHANE	1/6 MONTH	GRAB	FINAL EFFLUENT
011	CARBON TETRACHLORIDE	1/6 MONTH	GRAB	FINAL EFFLUENT
011	1,1,2,2,-TETRACHLOROETHANE	1/6 MONTH	GRAB	FINAL EFFLUENT
011	TRICHLOROETHENE	1/6 MONTH	GRAB	FINAL EFFLUENT
011	TETRACHLOROETHENE	1/6 MONTH	GRAB	FINAL EFFLUENT
011	TOLUENE	1/6 MONTH	GRAB	FINAL EFFLUENT
011	XYLENE	1/6 MONTH	GRAB	FINAL EFFLUENT
014	STORMWATER	1/3 MONTH	VISUAL	SEE PAGE 7 OF STORM WATER REQUIREMENTS
015	STORMWATER	1/3 MONTH	VISUAL	SEE PAGE 7 OF STORM WATER REQUIREMENTS
016	STORMWATER	1/3 MONTH	VISUAL	SEE PAGE 7 OF STORM WATER REQUIREMENTS
017	STORMWATER	1/3 MONTH	VISUAL	SEE PAGE 7 OF STORM WATER REQUIREMENTS
018	STORMWATER	1/3 MONTH	VISUAL	SEE PAGE 7 OF STORM WATER REQUIREMENTS
019	STORMWATER	1/3 MONTH	VISUAL	SEE PAGE 7 OF STORM WATER REQUIREMENTS
020	STORMWATER	1/3 MONTH	VISUAL	SEE PAGE 7 OF STORM WATER REQUIREMENTS
021	STORMWATER	1/3 MONTH	VISUAL	SEE PAGE 7 OF STORM WATER REQUIREMENTS
023	STORMWATER	1/3 MONTH	VISUAL	SEE PAGE 7 OF STORM WATER REQUIREMENTS
024	STORMWATER	1/3 MONTH	VISUAL	SEE PAGE 7 OF STORM WATER REQUIREMENTS
025	STORMWATER	1/3 MONTH	VISUAL	SEE PAGE 7 OF STORM WATER REQUIREMENTS

Monitoring and Reporting Requirements

(a) Samples and measurements taken shall be representative of the volume and nature of the monitored wastewater.

(b) Analytical and sampling methods as specified in 40 CFR Part 136 or other methods approved in writing by the department, shall be utilized.

(c) Chapter 63 of the rules provides you with further explanation of your monitoring requirements.

(d) You are required to report all data including calculated results needed to determine compliance with the limitations contained in this permit. This includes daily maximums and minimums, 30-day averages and 7-day averages for all parameters that have concentration (mg/l) and mass (lbs/day) limits. Also, flow data shall be reported in million gallons per day (MGD).

(e) Results of all monitoring shall be recorded on forms provided by the department, and submitted to the department by the fifteenth day following the close of the reporting period. Your reporting period is on a monthly basis, ending on the last day of each month.

Outfall Number	Wastewater Parameter	Sample Frequency	Sample Type	Monitoring Location
026	STORMWATER	1/3 MONTH	VISUAL	SEE PAGE 7 OF STORM WATER REQUIREMENTS
027	STORMWATER	1/3 MONTH	VISUAL	SEE PAGE 7 OF STORM WATER REQUIREMENTS
028	STORMWATER	1/3 MONTH	VISUAL	SEE PAGE 7 OF STORM WATER REQUIREMENTS
801	FLOW	5/WEEK	24 HR TOTAL	FINAL EFFLUENT
801	ACUTE TOXICITY, CERIODAPHNIA	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
801	ACUTE TOXICITY, PIMEPHALES	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT

Facility Name: John Deere Dubuque Works
Permit Number: 31-26-1-07

SPECIAL MONITORING REQUIREMENTS

Total Residual Chlorine: Outfall 004

Samples shall be collected at the condenser discharge before mixing with other wastestreams. Samples need to be collected only on days that the condenser is chlorinated.

Total Toxic Organics: Outfall 011

Total Toxic Organic pollutants shall be limited to the following parameters:

1,1 DCE	CARBON TET.
1,1 DCA	CHLOROFORM
T-1,2-DCE	BENZENE
1,1,1-TCA	ETHYLBENZENE
1,1,2 - TRICHLOROETHANE	TOLUENE
TETRACHLOROETHANE	XYLENE
1,1,2,2 TETRACHLOROETHANE	TCE

Stormwater: Outfall 009, 010, 014, 015, 016, 017, 018, 019, 020, 021, 023, 024, 025, 026, 027, and 028

See the attached "Stormwater Discharge Requirements" for Outfall applicability and monitoring parameters. Where an Outfall requires stormwater monitoring, the monitoring shall be conducted at the frequency and location specified by the "Monitoring and Reporting Requirements".

If John Deere maintains that each outfall in the groupings drains similarly compared to the other outfalls in the same groupings and probably contain similar pollutants, it is acceptable to conduct stormwater monitoring at only one of the outfalls in each grouping.

Facility Name: John Deere Dubuque Works
Permit Number: 31-26-1-07
Outfall Number: 002

Ceriodaphnia and Pimephales Toxicity Effluent Testing

1. For facilities that have not been required to conduct toxicity testing by a previous NPDES permit, the annual toxicity test shall be conducted within three months of permit issuance and at least annually thereafter. For facilities that have been required to conduct toxicity testing by a previous NPDES permit, the initial annual toxicity test shall be conducted within twelve months (12) of the last toxicity test.

2. The test organisms that are to be used for acute toxicity testing shall be *Ceriodaphnia dubia* and *Pimephales promelas*. The acute toxicity testing procedures used to demonstrate compliance with permit limits shall be those listed in 40 CFR Part 136 and adopted by reference in rule 567--63.1(1). The method for measuring acute toxicity is specified in USEPA. 1993. Methods for Measuring the Acute Toxicity of Effluents to Freshwater and Marine Organisms. Fourth Edition. Environmental Monitoring Systems Laboratory, U.S. Environmental Protection Agency, Cincinnati, Ohio August 1993, EPA/600/4-90/027F.

3. **The diluted effluent sample must contain a minimum of 91.8% effluent and no more than 8.2% of culture water.**

4. One valid positive toxicity result will require quarterly testing for effluent toxicity.

5. Two successive valid positive toxicity results or three positive results out of five successive valid effluent toxicity tests will require a toxic reduction evaluation to be completed to eliminate the toxicity.

6. A non-toxic test result shall be indicated as a "1" on the monthly operation report. A toxic test result shall be indicated as a "2" on the monthly operation report. DNR Form 542-1381 shall also be submitted to the DNR field office along with the monthly operation report.

Ceriodaphnia and Pimephales Toxicity Effluent Limits

The 30 day average mass limit of "1" for the parameters Acute Toxicity, Ceriodaphnia and Acute Toxicity, Pimephales means no positive toxicity results.

Definition: "Positive toxicity result" means a statistical difference of mortality rate between the control and the diluted effluent sample. For more information see USEPA. 1993. Methods for Measuring the Acute Toxicity of Effluents to Freshwater and Marine Organisms. Fourth Edition. Environmental Monitoring Systems Laboratory, U.S. Environmental Protection Agency, Cincinnati, Ohio August 1993, EPA/600/4-90/027F.

Facility Name: John Deere Dubuque Works
Permit Number: 31-26-1-07
Outfall Number: 801

Ceriodaphnia and Pimephales Toxicity Effluent Testing

1. For facilities that have not been required to conduct toxicity testing by a previous NPDES permit, the annual toxicity test shall be conducted within three months of permit issuance and at least annually thereafter. For facilities that have been required to conduct toxicity testing by a previous NPDES permit, the initial annual toxicity test shall be conducted within twelve months (12) of the last toxicity test.

2. The test organisms that are to be used for acute toxicity testing shall be *Ceriodaphnia dubia* and *Pimephales promelas.* The acute toxicity testing procedures used to demonstrate compliance with permit limits shall be those listed in 40 CFR Part 136 and adopted by reference in rule 567--63.1(1). The method for measuring acute toxicity is specified in USEPA. 1993. Methods for Measuring the Acute Toxicity of Effluents to Freshwater and Marine Organisms. Fourth Edition. Environmental Monitoring Systems Laboratory, U.S. Environmental Protection Agency, Cincinnati, Ohio August 1993, EPA/600/4-90/027F.

3. **The diluted effluent sample must contain a minimum of 79% effluent and no more than 21% of culture water.**

4. One valid positive toxicity result will require quarterly testing for effluent toxicity.

5. Two successive valid positive toxicity results or three positive results out of five successive valid effluent toxicity tests will require a toxic reduction evaluation to be completed to eliminate the toxicity.

6. A non-toxic test result shall be indicated as a "1" on the monthly operation report. A toxic test result shall be indicated as a "2" on the monthly operation report. DNR Form 542-1381 shall also be submitted to the DNR field office along with the monthly operation report.

Ceriodaphnia and Pimephales Toxicity Effluent Limits

The 30 day average mass limit of "1" for the parameters Acute Toxicity, Ceriodaphnia and Acute Toxicity, Pimephales means no positive toxicity results.

Definition: "Positive toxicity result" means a statistical difference of mortality rate between the control and the diluted effluent sample. For more information see USEPA. 1993. Methods for Measuring the Acute Toxicity of Effluents to Freshwater and Marine Organisms. Fourth Edition. Environmental Monitoring Systems Laboratory, U.S. Environmental Protection Agency, Cincinnati, Ohio August 1993, EPA/600/4-90/027F.

Facility Name: John Deere Dubuque Works
IA NPDES permit #: 31-26-1-07
Outfall #: 004

SPECIAL EFFLUENT LIMITATIONS

Compliance with the temperature limitations for Outfall #004, which prohibits the discharge of water which would increase the ambient stream temperature by more than 3 °C (5.4 °F), shall be determined by using the following formula for calculating temperature increase:

$$\Delta T = \frac{(D)}{Q} \times (T_d - T_q)$$

Where:

ΔT = temperature increase across mixing zone
T_d = temperature of discharge (°F)
T_q = temperature of river at intake (°F)
D = discharge flow (mgd)
Q = mixing zone flow (82.3 mgd)

The temperature of the river at intake (T_q) shall be measured upstream of the actual intake at a point beyond the influence of re-circulated water flow.

STORM WATER DISCHARGE REQUIREMENTS

This section authorizes the discharge of storm water from industrial activity associated with industrial activity from facilities that manufacture transportation equipment, industrial, or commercial machinery:

PART I. DESCRIPTION OF DISCHARGES COVERED UNDER THIS PERMIT

A. Discharges Covered Under This Section

This section applies to discharges(s) of storm water associated with the following industrial activities:

- industrial plant yards; material handling sites; refuse sites;
- sites used for application or disposal of process wastewater;
- sites used for storage and maintenance of material handling equipment;
- sites used for residual treatment, storage, or disposal; shipping and receiving areas;
- manufacturing buildings; storage areas for raw material and intermediate and finished products; and
- areas where industrial activity has taken place in the past and significant materials remain and are exposed to storm water.

B. Storm Water Discharge Not Associated With Industrial Activity

Storm water discharges associated with industrial activity authorized by this permit may be combined with other sources of storm water that are not classified as associated with industrial activity pursuant to 40 CFR 122.26(b)(14).

C. Limitation on Coverage

Unless otherwise authorized elsewhere in this NPDES permit, the following discharges are not authorized by this permit:

- the discharge of hazardous substances or oil resulting from an on-site spill;

- storm water discharge associated with industrial activity from construction activity, specifically any land disturbing activity of five or more acres;

D. Non-Storm Water Discharges

The following non-storm water discharges are authorized by this permit provided the non-storm water component of the discharge is in compliance with the conditions in Part III.A.3.g. of the pollution prevention plan required by this permit:

discharges from fire fighting activities; fire hydrant flushing; potable water sources including waterline flushing; drinking fountain water, uncontaminated compressor condensate, irrigation drainage; lawn watering; routine external building washdown that does not use detergents or other compounds; pavement washwaters where spills or leaks of toxic or hazardous materials have not occurred (unless all spilled material has been removed) and where detergents are not used; air conditioning condensate; compressor condensate; uncontaminated springs; uncontaminated ground water; and foundation or footing drains where flows are not contaminated with process materials such as solvents.

Appendix D

August 7, 2003 Five Year Review Site Inspection Check List, Interview Summary Forms, and Photograph Log

Site Inspection Checklist

I. SITE INFORMATION	
Site name: John Deere Dubuque Works	**Date of inspection: August 7, 2003**
Location and Region: Dubuque, Iowa, Region VII	**EPA ID: IAD005269527**
Agency, office, or company leading the five-year review: ARCADIS	**Weather/temperature: Sunny/80's**

Remedy Includes: (Check all that apply)

G Landfill cover/containment
X Access controls
X Institutional controls
G Groundwater pump and treatment
G Surface water collection and treatment
G Other_____

G Monitored natural attenuation
X Groundwater containment
G Vertical barrier walls

Attachments: **X Inspection team roster attached** **X Site map attached**

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** George Hellert (Name) Supervisor Environmental Engineering (Title) August 7, 2003 (Date)
   Interviewed **X at site** G at office G by phone Phone no. 562-589-6332
   Problems, suggestions; **X Report attached** _____

2. **O&M staff** Kevin Braun (Name) Engineer (Title) August 7, 2003 (Date)
   Interviewed **X at site** G at office G by phone Phone no. 563-589-6929
   Problems, suggestions; **X Report attached** _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____

4. **Other interviews** (optional) G Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents - Final Remedial Design Report September 1990**

X O&M manual	**X Readily available**	**X Up to date**	G N/A
G As-built drawings	G Readily available	G Up to date	X N/A
G Maintenance logs	G Readily available	G Up to date	X N/A

Remarks **In March and April 2003, the JDDW groundwater model was updated to incorporate the replacement and relocation of production wells PW-3A, PW-4A, and PW-7A. The updated groundwater model was then used to update the Well Management Plan (see Interview Records).**

2.	**Site-Specific Health and Safety Plan**	**X Readily available**	**XUp to date**	G N/A
	G Contingency plan/emergency response plan	X Readily available	G Up to date	X N/A
	Remarks			
3.	**O&M and OSHA Training Records**	**X Readily available**	**X Up to date**	X N/A
	Remarks 40 hour HAZWOPER training is current in case employees have to handle NAPL			
4.	***Permits and Service Agreements***			
	G Air discharge permit	G Readily available	G Up to date	X N/A
	G Effluent discharge	G Readily available	G Up to date	X N/A
	X Waste disposal, POTW	**X Readily available**	**X Up to date**	G N/A
	G Other permits	G Readily available	G Up to date	G N/A
	Remarks			
5.	**Gas Generation Records**	G Readily available	G Up to date	X N/A
	Remarks			
6.	**Settlement Monument Records**	G Readily available	G Up to date	X N/A
	Remarks			
7.	**Groundwater Monitoring Records**	**X Readily available**	**X Up to date**	G N/A
	Remarks			
8.	**Leachate Extraction Records**	G Readily available	G Up to date	X N/A
	Remarks			
9.	**Discharge Compliance Records**			
	G Air	G Readily available	G Up to date	X N/A
	X Water (effluent)	**X Readily available**	**X Up to date**	G N/A
	Remarks NPDES Permit, IDNR Monthly NPDES Reports			
10.	***Daily Access/Security Logs***	G Readily available	G Up to date	X N/A
	Remarks			

IV. O&M COSTS – N/A

1.	**O&M Organization**	
	G State in-house	G Contractor for State
	G PRP in-house	G Contractor for PRP
	G Federal Facility in-house	G Contractor for Federal Facility
	G Other	

2. **O&M Cost Records**
G Readily available G Up to date
G Funding mechanism/agreement in place
Original O&M cost estimate_____ G Breakdown attached

Total annual cost by year for review period if available

From_____ To_____ _____ G Breakdown attached
Date Date Total cost
From_____ To_____ _____ G Breakdown attached
Date Date Total cost
From_____ To_____ _____ G Breakdown attached
Date Date Total cost
From_____ To_____ _____ G Breakdown attached
Date Date Total cost
From_____ To_____ _____ G Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**
Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS X Applicable G N/A

A. Fencing The JDDW plant is surround by a fence - Security oversees plant seven days a week, 24 hrs/day, the plant also has surveillance cameras

1. **Fencing damaged** G Location shown on site map G Gates secured X N/A
Remarks_____

B. Other Access Restrictions

1. **Signs and other security measures** G Location shown on site map X N/A
Remarks_____

C. Institutional Controls (ICs)

1. **Implementation and enforcement** - *Fencing*

Site conditions imply ICs not properly implemented — G Yes X No G N/A

Site conditions imply ICs not being fully enforced — G Yes X No G N/A

Type of monitoring (*e.g.*, self-reporting, drive by) **Drive by and surveillance cameras**

Frequency **per shift**

Responsible party/agency **JDDW Plant Protection**

Contact **Mike Woodyard** (Name) **Supervisor** (Title) **563-589-5923** (Date Phone no.)

Reporting is up-to-date — G Yes G No X N/A

Reports are verified by the lead agency — G Yes G No X N/A

Specific requirements in deed or decision documents have been met — X Yes G No G N/A

Violations have been reported — G Yes G No G N/A

Other problems or suggestions: G Report attached

2. **Adequacy** **X ICs are adequate** G ICs are inadequate G N/A

Remarks

D. General

1. **Vandalism/trespassing** G Location shown on site map **X No vandalism evident**

Remarks

2. **Land use changes on site** G N/A

Remarks **Demolition of buildings U, V and V-1 on north side of plant – see aerial photograph supplied by George Hellert and interview form.**

3. **Land use changes off site** G N/A

Remarks **There were no off site zoning changes since last review**

VI. GENERAL SITE CONDITIONS

A. Roads G Applicable X N/A

1. **Roads damaged** G Location shown on site map G Roads adequate G N/A

Remarks

B. Other Site Conditions

Remarks _____

VII. LANDFILL COVERS G Applicable X N/A

A. Landfill Surface

1. **Settlement** (Low spots) G Location shown on site map G Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Cracks** G Location shown on site map G Cracking not evident
   Lengths_____ Widths_____ Depths_____
   Remarks_____

3. **Erosion** G Location shown on site map G Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Holes** G Location shown on site map G Holes not evident
   Areal extent_____ Depth_____
   Remarks_____

5. **Vegetative Cover** G Grass G Cover properly established G No signs of stress
   G Trees/Shrubs (indicate size and locations on a diagram)
   Remarks_____

6. **Alternative Cover (armored rock, concrete, etc.)** G N/A
   Remarks_____

7. **Bulges** G Location shown on site map G Bulges not evident
   Areal extent_____ Height_____
   Remarks_____

8. **Wet Areas/Water Damage** G Wet areas/water damage not evident
G Wet areas G Location shown on site map Areal extent_____
G Ponding G Location shown on site map Areal extent_____
G Seeps G Location shown on site map Areal extent_____
G Soft subgrade G Location shown on site map Areal extent_____
Remarks_____

9. **Slope Instability** G Slides G Location shown on site map G No evidence of slope instability
Areal extent_____
Remarks_____

B. Benches G Applicable G N/A
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** G Location shown on site map G N/A or okay
Remarks_____

2. **Bench Breached** G Location shown on site map G N/A or okay
Remarks_____

3. **Bench Overtopped** G Location shown on site map G N/A or okay
Remarks_____

C. Letdown Channels G Applicable G N/A
(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** G Location shown on site map G No evidence of settlement
Areal extent_____ Depth_____
Remarks_____

2. **Material Degradation** G Location shown on site map G No evidence of degradation
Material type_____ Areal extent_____
Remarks_____

3. **Erosion** G Location shown on site map G No evidence of erosion
Areal extent_____ Depth_____
Remarks_____

4. **Undercutting** G Location shown on site map G No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ G No obstructions
G Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
G No evidence of excessive growth
G Vegetation in channels does not obstruct flow
G Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations G Applicable G N/A

1. **Gas Vents** G Active G Passive
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs Maintenance
G N/A
Remarks_____

2. **Gas Monitoring Probes**
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs Maintenance G N/A
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs Maintenance G N/A
Remarks_____

4. **Leachate Extraction Wells**
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs Maintenance G N/A
Remarks_____

5. **Settlement Monuments** G Located G Routinely surveyed G N/A
Remarks_____

E. Gas Collection and Treatment G Applicable G N/A

1. **Gas Treatment Facilities**
   G Flaring G Thermal destruction G Collection for reuse
   G Good condition G Needs Maintenance
   Remarks_____

2. **Gas Collection Wells, Manifolds and Piping**
   G Good condition G Needs Maintenance
   Remarks_____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
   G Good condition G Needs Maintenance G N/A
   Remarks_____

F. Cover Drainage Layer G Applicable G N/A

1. **Outlet Pipes Inspected** G Functioning G N/A
   Remarks_____

2. **Outlet Rock Inspected** G Functioning G N/A
   Remarks_____

G. Detention/Sedimentation Ponds G Applicable G N/A

1. **Siltation** Areal extent_____ Depth_____ G N/A
   G Siltation not evident
   Remarks_____

2. **Erosion** Areal extent_____ Depth_____
   G Erosion not evident
   Remarks_____

3. **Outlet Works** G Functioning G N/A
   Remarks_____

4. **Dam** G Functioning G N/A
   Remarks_____

H. Retaining Walls G Applicable G N/A

1. **Deformations** G Location shown on site map G Deformation not evident
   Horizontal displacement_____ Vertical displacement_____
   Rotational displacement_____
   Remarks_____

2. **Degradation** G Location shown on site map G Degradation not evident
Remarks_____

I. **Perimeter Ditches/Off-Site Discharge** G Applicable G N/A

1. **Siltation** G Location shown on site map G Siltation not evident
Areal extent_____ Depth_____
Remarks_____

2. **Vegetative Growth** G Location shown on site map G N/A
G Vegetation does not impede flow
Areal extent_____ Type_____
Remarks_____

3. **Erosion** G Location shown on site map G Erosion not evident
Areal extent_____ Depth_____
Remarks_____

4. **Discharge Structure** G Functioning G N/A
Remarks_____

VIII. VERTICAL BARRIER WALLS G Applicable X N/A

1. **Settlement** G Location shown on site map G Settlement not evident
Areal extent_____ Depth_____
Remarks_____

2. **Performance Monitoring** Type of monitoring_____
G Performance not monitored
Frequency_____ G Evidence of breaching
Head differential_____
Remarks_____

IX. GROUNDWATER/SURFACE WATER REMEDIES **X Applicable** G N/A

A. **Groundwater Extraction Wells, Pumps, and Pipelines** **X Applicable** G N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
X Good condition X All required wells properly operating G Needs Maintenance G N/A
Remarks__**Beginning in April 2003, JDDW started using three plant production wells, PW-3A, PW-4A, and PW-7A, to supply production water for the JDDW plant. The three production wells are withdrawing sufficient groundwater to maintain an inward hydraulic gradient. The pump was removed from production well PW-5 and PW-5 is being retained as a backup well**

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
X Good condition G Needs Maintenance
Remarks_____

3. **Spare Parts and Equipment**

G Readily available G Good condition G Requires upgrade G Needs to be provided
Remarks N/A

B. Surface Water Collection Structures, Pumps, and Pipelines G Applicable X N/A

1. **Collection Structures, Pumps, and Electrical**

X Good condition G Needs Maintenance
Remarks

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**

X Good condition G Needs Maintenance
Remarks

3. **Spare Parts and Equipment**

G Readily available G Good condition G Requires upgrade G Needs to be provided
Remarks

C. Treatment System **X Applicable** G N/A

1. **Treatment Train** (Check components that apply)

G Metals removal **X Oil/water separation** G Bioremediation
G Air stripping G Carbon adsorbers
G Filters
G Additive (*e.g.*, chelation agent, flocculent)
G Others
G Good condition G Needs Maintenance
G Sampling ports properly marked and functional
G Sampling/maintenance log displayed and up to date
G Equipment properly identified
G Quantity of groundwater treated annually
G Quantity of surface water treated annually
Remarks **The NAPL Recovery System was discontinued in July 1991. The recovery wells and monitor wells are still monitored quarterly for NAPL.**

2. **Electrical Enclosures and Panels** (properly rated and functional)

X N/A G Good condition G Needs Maintenance
Remarks

3. **Tanks, Vaults, Storage Vessels**

X N/A G Good condition G Proper secondary containment G Needs Maintenance
Remarks

4. **Discharge Structure and Appurtenances**

X N/A G Good condition G Needs Maintenance
Remarks

5. **Treatment Building(s)**
X N/A G Good condition (esp. roof and doorways) G Needs repair
G Chemicals and equipment properly stored
Remarks_____

6. **Monitoring Wells** (pump and treatment remedy) – **Containment Remedy**
X Properly secured/locked **X Functioning** **X Routinely sampled** **X Good condition**
X All required wells located G Needs Maintenance G N/A
Remarks_____

D. Monitoring Data

1. Monitoring Data
X Is routinely submitted on time **X Is of acceptable quality**

2. Monitoring data suggests:
X Groundwater plume is effectively contained **X Contaminant concentrations are declining in all areas accept MW-13S**

D. Monitored Natural Attenuation N/A

1. **Monitoring Wells** (natural attenuation remedy)
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G All required wells located G Needs Maintenance G N/A
Remarks_____

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The remedy is a groundwater extraction system that maintains an inward hydraulic gradient to remediate and contain NAPL impacted groundwater. The plant production wells PW-3A, PW-4A, PW-5 and PW-7A were used to extract site groundwater during the third five-year review period. Beginning in April 2003, JDDW started using three plant production wells, PW-3A, PW4A, and PW-7A, to supply production water for the JDDW plant. The three production wells are withdrawing sufficient groundwater to maintain an inward hydraulic gradient. Production well PW-5 is being retained as a backup well. The remedy is maintaining an inward hydraulic gradient and functioning as designed

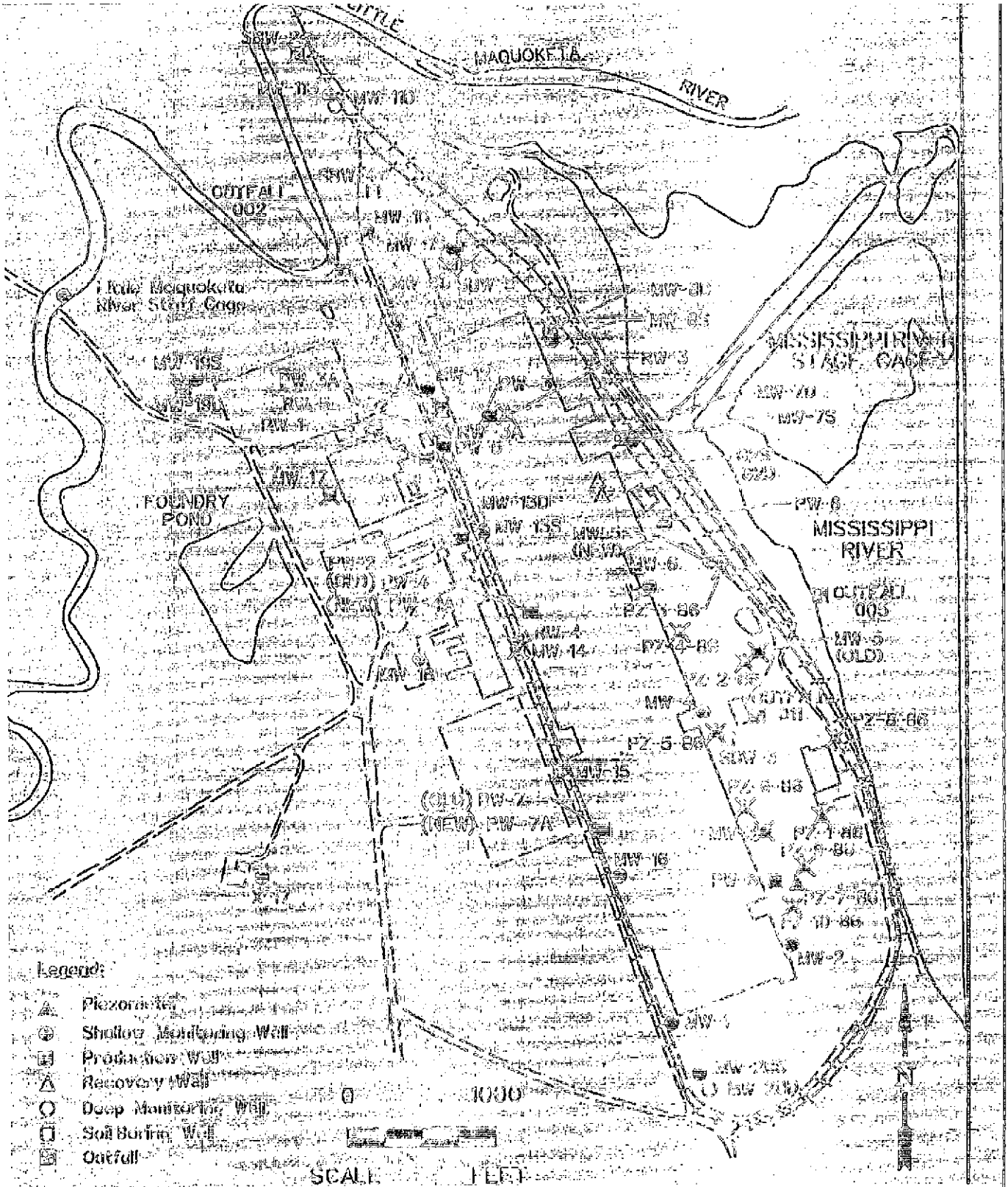
NAPL recovery operations were effective in removing the NAPL and were discontinued in July 1991. Recovery wells and monitoring wells have continuously been monitored for NAPL thickness as required by the Consent ecree.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

The site fencing, monitor wells, and recovery wells are all in good condition and well maintained

C.	Early Indicators of Potential Remedy Problems -
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future. Not Applicable
D.	Opportunities for Optimization
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. JDDW requests that EPA approve abandoning monitor well MW-13D. MW-13D has not had contaminant exceedances (inorganic or organic) in Performance Standards since 1990 (Appendix B). Relative to SBW-4, EPA approved abandoning SBW-4 during the second five year review; however, the abandonment of this well was delayed because NAPL was detected in the well. JDDW will develop and submit to EPA a plan detailing the monitoring program that will be implemented for NAPL monitoring. JDDW would like to reduce the river stage monitoring of the Mississippi River to monthly at the same time as the monitor well water levels since this data is only used in the development of site water table maps. The reduction in the number of production wells used to withdrawal groundwater will optimize the use of the production wells and reduce JDDW's operating costs



An X Through the Well Symbol Indicates the Well Has Been Abandoned

Source: Modified from Geraghty & Miller 1991

ARCADIS
3903 Northdale Boulevard, Suite 120
Tampa, Florida 33624
Tel: 813/961-1921 Fax 813/961-2599

WELL LOCATION MAP

JOHN DEERE DUBUQUE WORKS
DUBUQUE, IOWA

FIGURE 3

John Deer Dubuque Works
Third Five-Year Review Site Inspection
August 7, 2003 Inspection Team Roster

Name	Title	Organization
Kathy Thalman	Project Scientist II	ARCADIS
George Hellert	Supervisor Environmental Engineering	JDDW

INTERVIEW DOCUMENTATION FORM

The following is a list of individual interviewed for this five-year review. See the attached contact record(s) for a detailed summary of the interviews.

Name	Title/Position	Organization	Date
George Hellert	Supervisor Environmental Engineering	John Deere Dubuque Works	August 7, 2003
Kevin Braun	Engineer	John Deere Dubuque Works	August 7, 2003

INTERVIEW RECORD

Site Name: John Deer Dubuque Works		**EPA ID No.:** IAD005269527
Subject: Building demolition, production wells, Well Management Plan		**Time:** 8:15 am **Date:** 8/7/03
Type: 9 Telephone X Visit 9 Other **Location of Visit:** John Deer Dubuque Works		X Incoming 9 Outgoing

Contact Made By:

Name: Kathy Thalman	**Title:** Project Scientist	**Organization:** ARCADIS

Individual Contacted:

Name: George Hellert	**Title:** Supervisor Environmental Engineering	**Organization:** John Deere Dubuque Works

Telephone No: 563-589-6332 **Fax No:** 563-589-5900 **E-Mail Address:** HellertGeorgeK@JohnDeere.com	**Street Address:** 18600 S. John Deere Road **City, State, Zip:** Dubuque, Iowa 52001-9757

Summary Of Conversation

George Hellert gave a brief summary of the JDDW site history and then reviewed the land use changes on the JDDW site that have occurred since the 2nd five-year review. In 1998, JDDW closed down and demolished buildings I, J, and K used for miscellaneous manufacturing. In 2003, JDDW demolished Engine Manufacturing Buildings U, V, and V1. The locations of these buildings are shown on the attached aerial photograph provided by JDDW. Due to the decrease in production at the JDDW facility, the plant requires less water for production and therefore does not need to pump water from the all four production wells (PW-3A, PW-4A, PW-5, and PW-7A). The decreased water requirement resulted in the PW-3A pump burning up because this well continued to try to pump water when the plant wasn't using it. When JDDW realized that the plant required less production water, JDDW reevaluated the site Well Management Plan. Since the replacement and relocation of production wells PW-3A, PW-4A and PW-7A and monitor well MW-5 had not been consolidated into the groundwater model, JDDW contracted ARCADIS to update the existing JDDW groundwater model to incorporate the replacement and relocation of these wells and revise the Well Management Plan. The April 9, 2003, ARCADIS memorandum that summaries the modifications made to the existing model as well as the revisions to the Well Management Plan are attached to this interview summary. The updated Well Management Plan will be used to make sure JDDW meets environmental requirements. Using the updated Well Management Plan, JDDW determined that they could use three production wells to provide water for the plant and meet the environmental requirements. JDDW decided to use production well PW-3A, PW-4A, and PW-7A. The pump from PW-4A was placed in PW-3A and the PW-5 pump was placed in PW-4A. PW-5 will be retained as a backup well. The reduction in groundwater withdrawal will optimize the use of the production wells and reduce JDDW's operating costs.

George Hellert indicated that there have been no complaints from the adjacent property owners.

INTERVIEW RECORD

Site Name: John Deer Dubuque Works		**EPA ID No.:** IAD005269527
Subject: Production Wells, Well Management Plan		**Time:** 3:50 pm **Date:** 8/7/03
Type: 9 Telephone **X Visit** 9 Other **Location of Visit:** John Deer Dubuque Works		9 Incoming **X Outgoing**
Contact Made By:		
Name: Kathy Thalman	**Title:** Project Scientist	**Organization:** ARCADIS
Individual Contacted:		
Name: Kevin Braun	**Title:** Engineer	**Organization:** John Deere Dubuque Works
Telephone No: 563-589-5900 **Fax No:** 563-589-6001 **E-Mail Address:** BraunKevinG@JohnDeere.com		**Street Address:** 18600 S. John Deere Road **City, State, Zip:** Dubuque, Iowa 52001-9757

Summary Of Conversation

JDDW is meeting plant production requirements without PW-5 and the plant water production is above environmental requirements. If JDDW approaches a place where the Superfund requirements drive the water production, the water production rate will be watched carefully and the Well Management Plan will be used to determine pumping rates required to maintain an inward gradient


0 50 100 200m
0 200 500 1000ft.

ARCADIS

ARCADIS G&M, Inc.
1131 Benfield Boulevard
Suite A
Millersville
Maryland 21108
Tel 410 987 0032
Fax 410.987 4392

MEMO

To:
Kathy Thalman

Copies:
Scott Potter, PhD., P.E.
Pedro Fierro

From:
Marc Killingstad

Date:
9 April 2003

ARCADIS Project No.:
TF001034.0013.MD001

Subject:
Additional Groundwater Modeling at the John Deere Dubuque Works

---

The existing John Deere Dubuque Works (JDDW) groundwater model, which was originally developed to manage hydraulic containment of groundwater beneath the Dubuque Works (the Site), was updated to incorporate the replacement and relocation of production wells PW-3A, PW-4A, and PW-7A. The updated groundwater model was used to revise the Well Management Plan, which provides guidelines for operating the alluvial aquifer production system to maintain hydraulic gradient control of the groundwater at the site. This memorandum summarizes the modifications made to the existing model as well as revisions made to the Well Management Plan.

Review and Verification of Existing MODFLOW Data Sets

The first task that was performed was a review of the existing JDDW modeling files and documents associated with the calibrated groundwater flow model originally developed by Geraghty & Miller (1990). The United States Environmental Protection Agency (USEPA) accepted this model to be a reasonable tool for predicting groundwater flow directions and water levels beneath the Site. Section 2 of the September 1990 Final Remediation Design Report was the primary source of information for this review as it provides full details of the calibrated groundwater model. Once the document review was completed, the original calibrated MODFLOW data files were retrieved from computer archives. A copy of the five-layer MODFLOW model was constructed from these files and the data sets were examined to ensure that they were identical to those reported in the 1990 report. A model simulation was also performed to verify that the results matched what was presented in the 1990 report.

Furthermore, Geraghty & Miller performed additional modeling work in May 1996. This work essentially consisted of refining the finite-difference grid mesh of the accepted USEPA model in order to more accurately locate the optimal position for new production wells. As with the original calibrated model, the refined MODFLOW data files were retrieved from computer archives and a simulation was performed to verify that the results closely match those of the 1990 USEPA unrefined model.

Briefly, mesh refinement is achieved by decreasing the spacing between rows and columns in the original finite-difference grid. For the JDDW groundwater model, the finite-difference grid was refined by a factor of four. That is, each row and column in the original model was subdivided into four rows and four columns. This refinement was achieved using a utility program that reads MODFLOW data files, generates a refined mesh based on a user-specified refinement factor, and assigns boundary conditions and aquifer properties in the refined mesh using the original values and an interpolation routine. The original grid was discretized into a finite-difference grid consisting of 56 rows and 38 columns with a grid spacing of 200-feet by 200-feet in the vicinity of the Site. After refinement, the finite-difference grid consisted of 224 rows and 152 columns with a grid spacing of 50-feet by 50-feet in the vicinity of the Site.

Verification that the retrieved MODFLOW data sets (both the refined and unrefined) matched those previously accepted by USEPA was accomplished by performing a detailed comparison of: (1) input data files that incorporate boundary conditions and aquifer properties; (2) data files containing statistical output for calibration targets; and (3) simulated water level contour plots. The original calibrated water level contours are presented in Figure 1 while the simulated water level contours resulting from the refined MODFLOW data files are presented in Figure 2. Note that the contours are virtually indistinguishable—only very minor differences exist that are attributable to the grid refinement (i.e., closer approximation of governing equations). This review showed that the retrieved data sets and corresponding model output were consistent with those previously presented in the 1990 report. Therefore, based on this review the refined data sets were considered to be a valid working copy of the Site groundwater flow model, which was previously accepted by the USEPA.

Changes to MODFLOW Data Files for Updated Simulations

Except for updates to the MODFLOW well file (specified below), no changes were made to the model boundary conditions, and the hydraulic properties of the aquifer were left intact for the updated well management plan simulations. The locations and well construction specifications of the new production wells (PW-3A, PW-4A, and PW-7A) were compared to the original production wells (PW-3, PW-4, and PW-7) used in the model. Since well PW-5 has not been replaced, model input data for this well is unchanged. However, the location of well PW-3A is approximately 350 feet east of the original location of PW-3, while wells PW-4A and PW-7A are located within 15 feet of the original well locations (i.e., PW-4 and PW-7). Since PW-4A and PW-7A are located within the same grid cell as PW-4 and PW-7 (i.e., 50-ft by 50-ft grid spacing), the original well locations within the model were preserved. However, PW-3A was moved from the original location (PW-3) accordingly. Well construction details for the original and new production wells are

presented in Table 1. Based on the information presented in Table 1 changes were made to the refined model where appropriate. Figure 3 depicts the simulated water level contours resulting from the refined MODFLOW data files with the updated well locations. The production well rates utilized for this simulation mimic those rates used in the original calibrated model (Figure 1) and the refined calibrated model (Figure 2).

It should be noted that the original model was calibrated to average hydrological conditions at the Site; however, the model was also used to evaluate "extreme" hydrological conditions. "Extreme" conditions were described as when above average precipitation and below average Mississippi River stage occur simultaneously. For that reason, "extreme" conditions were defined by the 5th percentile river stage (602.10 ft above mean sea level) and the 95th percentile precipitation value (43.29 inches/year). The impact of these two values on hydraulic containment was investigated as part of the original Well Management and Contingency Plans and, therefore, will also be evaluated as part of this updated modeling task. The original data files used to simulate the "extreme" conditions were updated as part of this task and incorporated into the refined model.

Updated Well Management Plan Simulations

Once the new production well information was incorporated into the refined MODFLOW data files, the model was used to support amendments to the Well Management Plan. The objective of the updated Well Management Plan modeling simulations is to determine the minimum rates in the new production well system required to obtain hydraulic control of groundwater beneath the Site while meeting head difference performance standards. Groundwater extraction from the JDDW production wells must control hydraulic gradients along the perimeter of the Site to assure compliance with the Consent Decree Performance Standards. The performance standards required for compliance are delineated as follows:

Northern Perimeter: Water level in well MW-11S must be at least 0.15 feet higher than the water level in well MW-10.

Eastern Perimeter: Water level in well MW-5N must be at least 0.15 feet higher than the water level in well MW-6.

Western Perimeter: Water level in well MW-20S must be at least 0.10 feet higher than the water level in well MW-1.

As with the original Well Management Plan simulations, linear programming, in conjunction with the flow model, was utilized to optimize groundwater extraction at the Site. This technique provides an efficient alternative to trial-and-error flow model simulations, and it allows JDDW to monitor and adjust production well pumping rates on a regular basis. A linear program developed specifically for the JDDW site, HDIFF, was used in the original Well Management Plan simulations and, therefore, was used to modify the Well Management Plan. Details of the HDIFF program can be found in Geraghty & Miller (1990).

Fundamentally, in HDIFF the objective function subject to minimization is the total pumping rate in the four alluvial aquifer production wells (PW-3A, PW-4A, PW-5, and PW-7A) with the following constraints: (1) the hydraulic head differences in the three perimeter monitoring well pairs; and (2) the practical ranges of pumping rates in each of the alluvial aquifer production wells. This objective function is described using a linear expression that contains response coefficients. These response coefficients describe the change in the hydraulic head difference at a specified well pair with respect to the change in pumping at a specified production well. Because production wells PW- 3, PW-4, and PW-7 have been replaced since development of the original Well Management Plan, the response coefficients were recomputed. The updated groundwater flow model was utilized to calculate the response coefficients associated with the newly configured production well system.

It should be noted that the original response coefficients associated with the head difference in the MW-5/MW-6 well pair were based upon the location of the "old" MW-5. The "old" MW-5, however, was replaced in 1994 with MW-5N, which is located several hundred feet northwest of the "old" MW-5. This change was taken into account when updating the response coefficients associated with the MW-5/MW-6 well pair. After all response coefficients were recomputed, the HDIFF program was employed to determine optimal feasible solutions (i.e., minimized pumping rates) for varying constraints.

Results

Minimum total pumping rates were determined for both "average" and "extreme" hydrologic conditions. "Average" conditions refer to conditions simulated by the calibrated steady-state model using the boundary conditions and hydraulic parameter values presented in Section 2.3.1 of Geraghty & Miller (1990). "Extreme" conditions were described as when above average precipitation and below average Mississippi River stage occur simultaneously (see Section 2.3.2 of Geraghty & Miller, 1990). The "extreme" conditions quantify the minimum required pumping rates under variable hydrologic conditions.

Minimum pumping rates that still maintain inward hydraulic control of the Site groundwater (i.e., meet performance standards) under both "average" and "extreme" conditions are presented in Table 2 (note: mgd = million gallons per day). Optimal control of the hydraulic gradient along the Site perimeter under "average" conditions is obtained by pumping production wells PW-3A, PW-4A, and PW-7A at 0.137 mgd, 0.296 mgd, and 0.410 mgd, respectively. The total rate under "average" conditions was 0.843 mgd. Table 2 also presents the hydraulic head differences predicted by HDIFF at the three compliance well pairs. To verify the accuracy of the HDIFF solution, the optimal minimum rates specified by HDIFF were incorporated into the numerical flow model. The head differences resulting from the model simulation are also listed in Table 2 and closely match those predicted by HDIFF.

Under "extreme" conditions optimal control of the hydraulic gradient along the Site perimeter is obtained by pumping production wells PW-3A, PW-4A, and PW-7A at 0.112 mgd, 0.370 mgd, and 0.400 mgd, respectively. The total rate under "extreme" conditions was 0.882 mgd. The total pumping rate is slightly higher under "extreme" hydrologic conditions because steady-state hydraulic gradients under nonpumping

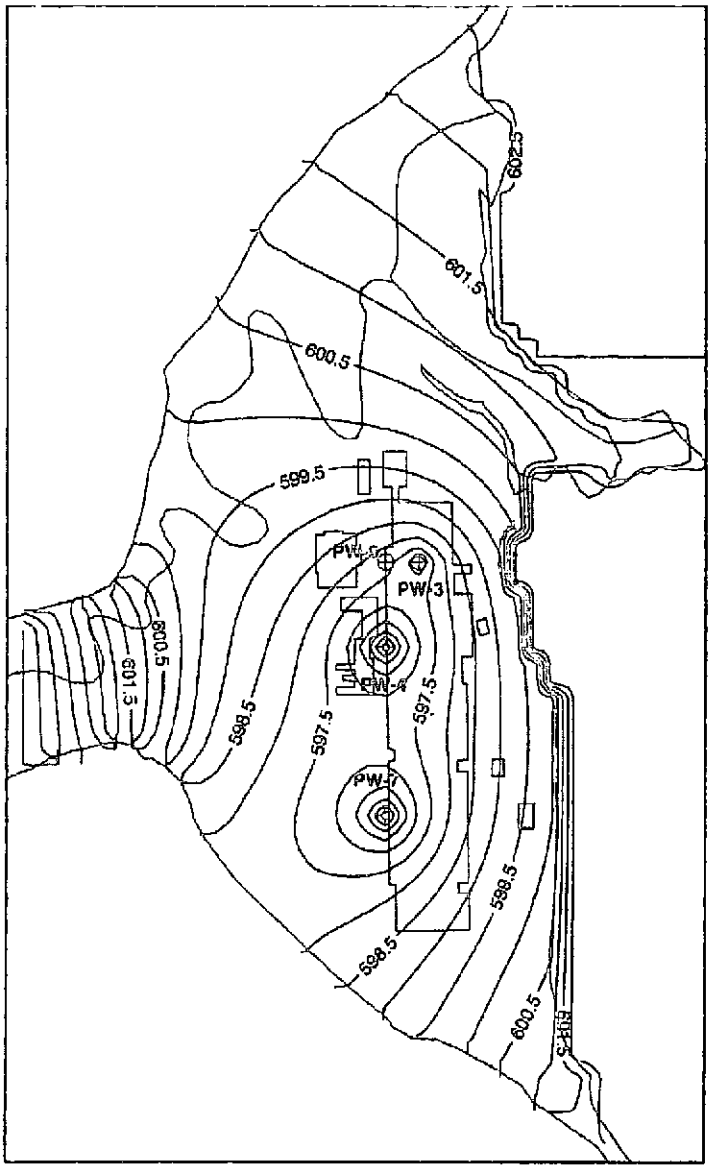
conditions are slightly larger under "extreme" conditions. As with the "average" conditions, Table 2 also presents the hydraulic head differences predicted by HDIFF and the numerical model at the three compliance well pairs. The head differences resulting from the model simulation under "extreme" conditions closely match those predicted by HDIFF.

Minimum pumping rates necessary for maintaining inward hydraulic gradients under "average" hydrologic conditions when the pumping rate is specified in one production well is presented in Tables 3 through 6. These tables provide information to be used for the management of production well operation. In general, as long as any listed rate combinations are met or exceeded at the Site, the required head differences in the compliance well pairs will be maintained under "average" conditions.

Likewise, minimum pumping rates necessary for maintaining inward hydraulic gradients under "extreme" hydrologic conditions when the pumping rate is specified in one production well is presented in Tables 7 through 10. Note that the maximum difference between minimal total pumping rates under "average" and "extreme" conditions is approximately 9%. The tables developed for the "extreme" conditions provide additional assurance that the hydraulic gradient performance standards will be met under any potential hydrologic condition.

The use of the tables (Tables 3 through 10) for the operation and maintenance of JDDW production wells is straightforward: to operate a single well at a specified rate under normal production well operation, simply refer to the appropriate table; if maintenance is required for a specific well, each table shows the minimum pumping rates required for a rate equal to zero (0.0 mgd). In either case (i.e., normal operation or maintenance), hydraulic head difference performance standards are met as long as the rate combinations listed in the tables are either met or exceeded.

An additional analysis was performed in the event that production well PW-5 (the oldest remaining production well) was ever completely shut down. Table 11 shows the results of this optimization analysis under various maintenance scenarios (i.e., if maintenance is required for a specific well, the table shows the minimum pumping rates required for a rate equal to 0.0 mgd if PW-5 were to be abandoned) and under both average and extreme conditions. Table 11 provides general guidelines for production wells in the event that PW-5 should ever be abandoned. For more specific production scenarios if PW-5 is shutdown the use of HDIFF is recommended.



CONTOUR INTERVAL = 0.5 FEET

LEGEND

0 1000 2000

597.5 SIMULATED WATER LEVEL CONTOUR (FT AMSL)

⊕ PW-5 PRODUCTION WELL LOCATION AND DESIGNATION

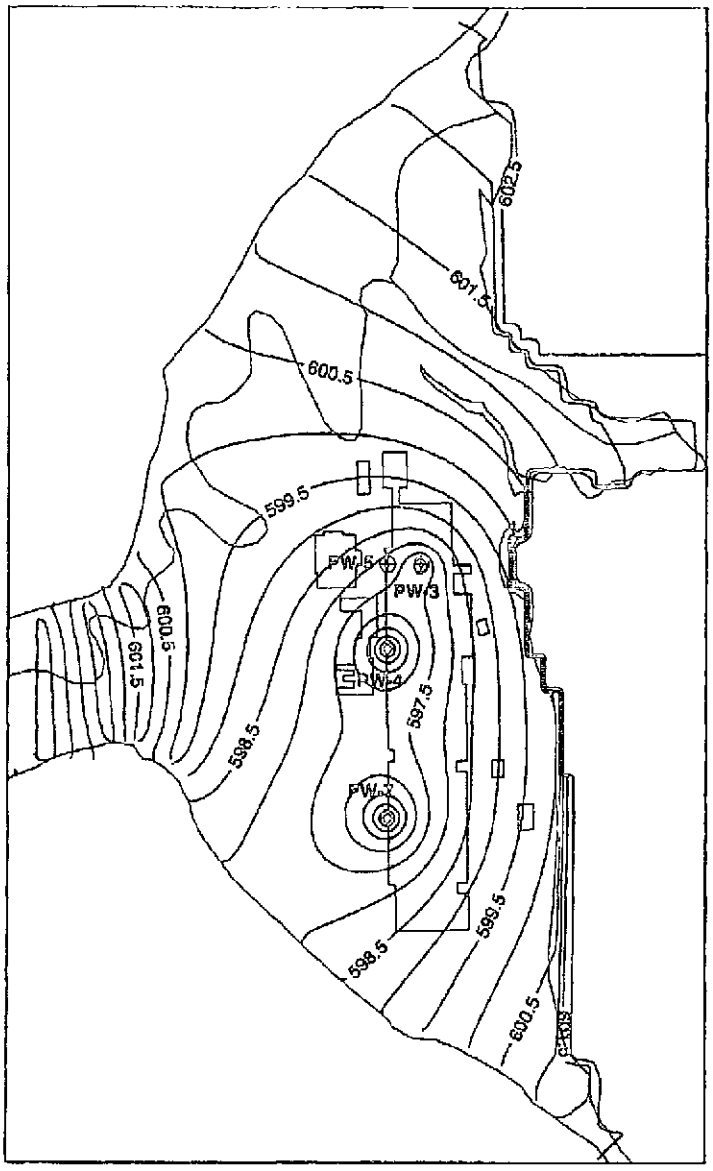
ARCADIS

Simulated Water-Table Contours Original Calibrated Model (Average Conditions)

JOHN DEERE DUBUQUE WORKS
DUBUQUE, IOWA

FIGURE 1

DWG DATE: 4/04/03 | PRJCT NO.: MD000704.FT15 | FILE NO.: Figure 1 | CHECKED: STP | APPROVED: STP | DRAFTER: MWK



CONTOUR INTERVAL = 0.5 FEET

LEGEND

0 1000 2000

597.5 SIMULATED WATER LEVEL CONTOUR (FT AMSL)

⊕ PW-5 PRODUCTION WELL LOCATION AND DESIGNATION

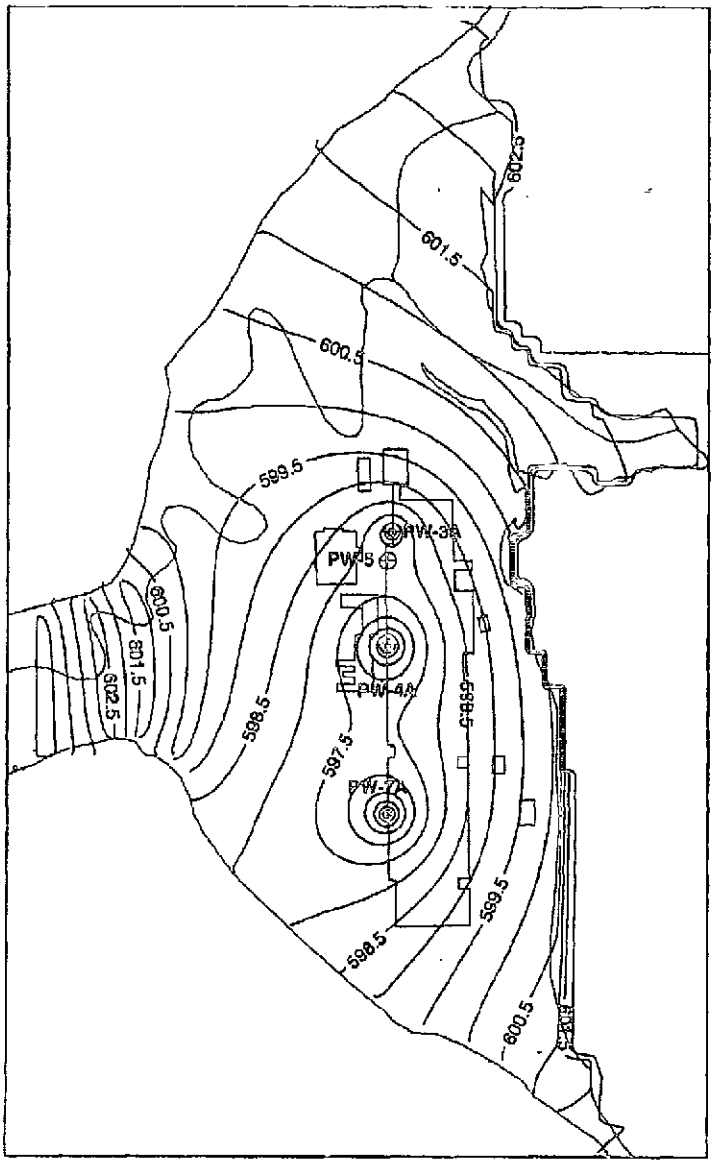
DWG DATE: 4/04/03 | PRJCT NO.: MD000704.FT15 | FILE NO.: Figure 2 | CHECKED: STP | APPROVED: STP | DRAFTER: MWK

ARCADIS

Simulated Water-Table Contours Refined Calibrated Model (Average Conditions)

JOHN DEERE DUBUQUE WORKS
DUBUQUE, IOWA

FIGURE 2



CONTOUR INTERVAL = 0.5 FEET

LEGEND

0 1000 2000

597.5 SIMULATED WATER LEVEL CONTOUR (FT AMSL)

PW-5 PRODUCTION WELL LOCATION AND DESIGNATION

DWG DATE: 4/04/03 | PRJCT NO.: MD000704.FT15 | FILE NO.: Figure 3 | CHECKED: STP | APPROVED: STP | DRAFTER: MWK

ARCADIS

Simulated Water-Table Contours Refined Calibrated Model With New Wells (Average Conditions)

JOHN DEERE DUBUQUE WORKS
DUBUQUE, IOWA

FIGURE 3

Table 1. Production Well Construction Details.

Well	Date Drilled	Year Abandoned	Well Completion Depth (ft)	Well Diameter (in)	Bottom Casing Depth (ft)	Screen 1 Interval (ft BGS)	Screen 2 Interval (ft BGS)
PW-3	Oct-58	1997	148	24	70	70-95	110-135
PW-3A	Apr-97		139	24		73-139	N/A
PW-4	May-63	1995	133	24	81	81-133	N/A
PW-4A	May-95		136	24	70	70-136	N/A
PW-5	Apr-63		139	24	87	87-139	N/A
PW-7	1973	1995	140	24	90	90-140	N/A
PW-7A	Sep-95		133	24	69.5	69.5-133	N/A

N/A = Not applicable

BGS = below ground surface

Table 2. Comparison of Hydraulic Head Differences in JDDW Well Pairs Predicted by Linear Programming and Numerical Modeling Methods.

(A) Average Conditions

Solution Method	Simulated Pumping Rate (mgd)				Hydraulic Head Difference (ft)		
	PW-3A	PW-4A	PW-5	PW-7A	MW-20S & MW-1	MW-5N & MW-6	MW-11S & MW-10
Linear Programming	0.137	0.296	0.00	0.410	0.100	0.150	0.150
Numerical Modeling	0.137	0.296	0.00	0.410	0.100	0.150	0.151

(B) Extreme Conditions

Solution Method	Simulated Pumping Rate (mgd)				Hydraulic Head Difference (ft)		
	PW-3A	PW-4A	PW-5	PW-7A	MW-20S & MW-1	MW-5N & MW-6	MW-11S & MW-10
Linear Programming	0.112	0.370	0.00	0.400	0.100	0.150	0.150
Numerical Modeling	0.112	0.370	0.00	0.400	0.101	0.151	0.150

Table 3. Minimum Pumping Rates Required for Hydraulic Gradient Control Given a Specified Pumping Rate in PW-3A Under "Average" Hydrologic Conditions.

Specified Pumping Rate, PW-3A (mgd)	Minimum Pumping Rate (mgd)			Total Rate (mgd)
	PW-4A	PW-5	PW-7A	
0.00	0.241	0.204	0.408	0.853
0.10	0.281	0.055	0.409	0.845
0.20	0.263	0.00	0.407	0.87
0.30	0.210	0.00	0.402	0.912
0.40	0.157	0.00	0.397	0.954
0.50	0.104	0.00	0.392	0.996
0.60	0.051	0.00	0.388	1.039
0.70	0.031	0.00	0.382	1.113
0.80	0.00	0.00	0.357	1.157
0.90	0.00	0.00	0.331	1.231
1.00	0.00	0.00	0.305	1.305
1.10	0.00	0.00	0.280	1.38
1.20	0.00	0.00	0.254	1.454
1.30	0.00	0.00	0.229	1.529
1.40	0.00	0.00	0.203	1.603

"Average" hydrologic conditions defined by calibrated steady-state flow model.

Table 4. Minimum Pumping Rates Required for Hydraulic Gradient Control Given a Specified Pumping Rate in PW-4A Under "Average" Hydrologic Conditions.

Specified Pumping Rate, PW-4A (mgd)	Minimum Pumping Rate (mgd)			Total Rate (mgd)
	PW-3A	PW-5	PW-7A	
0.00	0.00	0.587	0.391	0.978
0.10	0.00	0.428	0.398	0.926
0.20	0.00	0.269	0.405	0.874
0.30	0.136	0.00	0.409	0.845
0.40	0.091	0.00	0.381	0.872
0.50	0.046	0.00	0.353	0.899
0.60	0.001	0.00	0.326	0.927
0.70	0.00	0.00	0.287	0.987
0.80	0.00	0.00	0.247	1.047
0.90	0.00	0.00	0.208	1.108
1.00	0.00	0.00	0.169	1.169
1.10	0.00	0.00	0.130	1.23
1.20	0.00	0.00	0.091	1.291
1.30	0.00	0.00	0.051	1.351
1.40	0.00	0.00	0.012	1.412

"Average" hydrologic conditions defined by calibrated steady-state flow model.

Table 5. Minimum Pumping Rates Required for Hydraulic Gradient Control Given a Specified Pumping Rate in PW-5 Under "Average" Hydrologic Conditions.

Specified Pumping Rate, PW-5 (mgd)	Minimum Pumping Rate (mgd)			Total Rate (mgd)
	PW-3A	PW-4A	PW-7A	
0.00	0.137	0.296	0.410	0.843
0.10	0.070	0.269	0.409	0.848
0.20	0.003	0.242	0.408	0.853
0.30	0.00	0.180	0.403	0.883
0.40	0.00	0.117	0.399	0.916
0.50	0.00	0.054	0.395	0.949
0.60	0.00	0.00	0.387	0.987
0.70	0.00	0.00	0.358	1.058
0.80	0.00	0.00	0.329	1.129
0.90	0.00	0.00	0.300	1.2
1.00	0.00	0.00	0.271	1.271
1.10	0.00	0.00	0.242	1.342
1.20	0.00	0.00	0.213	1.413
1.30	0.00	0.00	0.184	1.484
1.40	0.00	0.00	0.155	1.555

"Average" hydrologic conditions defined by calibrated steady-state flow model.

Table 6. Minimum Pumping Rates Required for Hydraulic Gradient Control Given a Specified Pumping Rate in PW-7A Under "Average" Hydrologic Conditions.

Specified Pumping Rate, PW-7A (mgd)	Minimum Pumping Rate (mgd)			Total Rate (mgd)
	PW-3A	PW-4A	PW-5	
0.00	0.00	1.431	0.00	1.431
0.10	0.00	1.176	0.00	1.276
0.20	0.00	0.921	0.00	1.121
0.30	0.00	0.666	0.00	0.966
0.40	0.121	0.332	0.00	0.853
0.50	0.123	0.270	0.00	0.893
0.60	0.107	0.241	0.00	0.948
0.70	0.091	0.213	0.00	1.004
0.80	0.075	0.184	0.00	1.059
0.90	0.059	0.155	0.00	1.114
1.00	0.043	0.126	0.00	1.169
1.10	0.027	0.097	0.00	1.224
1.20	0.012	0.068	0.00	1.28
1.30	0.00	0.037	0.00	1.337
1.40	0.00	0.00	0.00	1.4

"Average" hydrologic conditions defined by calibrated steady-state flow model.

Table 7. Minimum Pumping Rates Required for Hydraulic Gradient Control Given a Specified Pumping Rate in PW-3A Under "Extreme" Hydrologic Conditions.

Specified Pumping Rate, PW-3A (mgd)	Minimum Pumping Rate (mgd)			Total Rate (mgd)
	PW-4A	PW-5	PW-7A	
0.00	0.324	0.168	0.399	0.891
0.10	0.365	0.018	0.400	0.883
0.20	0.324	0.00	0.397	0.921
0.30	0.270	0.00	0.392	0.962
0.40	0.217	0.00	0.388	1.005
0.50	0.164	0.00	0.383	1.047
0.60	0.110	0.00	0.379	1.089
0.70	0.057	0.00	0.375	1.132
0.80	0.004	0.00	0.370	1.174
0.90	0.00	0.00	0.347	1.247
1.00	0.00	0.00	0.322	1.322
1.10	0.00	0.00	0.297	1.397
1.20	0.00	0.00	0.272	1.472
1.30	0.00	0.00	0.247	1.547
1.40	0.00	0.00	0.223	1.623

"Extreme" hydrologic conditions defined by above average precipitation recharge (9.85 in/yr) and below average Mississippi River stage (602.10 ft AMSL).

Table 8. *Minimum Pumping Rates Required for Hydraulic Gradient Control Given a Specified Pumping Rate in PW-4A Under "Extreme" Hydrologic Conditions.*

Specified Pumping Rate, PW-4A (mgd)	Minimum Pumping Rate (mgd)			Total Rate (mgd)
	PW-3A	PW-5	PW-7A	
0.00	0.00	0.678	0.379	1.057
0.10	0.00	0.520	0.385	1.005
0.20	0.00	0.363	0.391	0.954
0.30	0.00	0.205	0.397	0.902
0.40	0.099	0.00	0.392	0.891
0.50	0.054	0.00	0.365	0.919
0.60	0.009	0.00	0.338	0.947
0.70	0.00	0.00	0.302	1.002
0.80	0.00	0.00	0.263	1.063
0.90	0.00	0.00	0.225	1.125
1.00	0.00	0.00	0.186	1.186
1.10	0.00	0.00	0.148	1.248
1.20	0.00	0.00	0.110	1.31
1.30	0.00	0.00	0.071	1.371
1.40	0.00	0.00	0.033	1.433

"Extreme" hydrologic conditions defined by above average precipitation recharge (9.85 in/yr) and below average Mississippi River stage (602.10 ft AMSL).

Table 9. Minimum Pumping Rates Required for Hydraulic Gradient Control Given a Specified Pumping Rate in PW-5 Under "Extreme" Hydrologic Conditions.

Specified Pumping Rate, PW-5 (mgd)	Minimum Pumping Rate (mgd)			Total Rate (mgd)
	PW-3A	PW-4A	PW-7A	
0.00	0.112	0.370	0.400	0.882
0.10	0.045	0.343	0.399	0.887
0.20	0.00	0.303	0.398	0.901
0.30	0.00	0.240	0.394	0.934
0.40	0.00	0.176	0.390	0.966
0.50	0.00	0.113	0.386	0.999
0.60	0.00	0.049	0.382	1.031
0.70	0.00	0.00	0.373	1.073
0.80	0.00	0.00	0.345	1.145
0.90	0.00	0.00	0.316	1.216
1.00	0.00	0.00	0.288	1.288
1.10	0.00	0.00	0.260	1.36
1.20	0.00	0.00	0.232	1.432
1.30	0.00	0.00	0.203	1.503
1.40	0.00	0.00	0.175	1.575

"Extreme" hydrologic conditions defined by above average precipitation recharge (9.85 in/yr) and below average Mississippi River stage (602.10 ft AMSL).

Table 10. Minimum Pumping Rates Required for Hydraulic Gradient Control Given a Specified Pumping Rate in PW-7A Under "Extreme" Hydrologic Conditions.

Specified Pumping Rate, PW-7A (mgd)	Minimum Pumping Rate (mgd)			Total Rate (mgd)
	PW-3A	PW-4A	PW-5	
0.00	0.00	1.485	0.00	1.485
0.10	0.00	1.226	0.00	1.326
0.20	0.00	0.965	0.00	1.165
0.30	0.00	0.704	0.00	1.004
0.40	0.111	0.372	0.00	0.883
0.50	0.096	0.342	0.00	0.938
0.60	0.080	0.313	0.00	0.993
0.70	0.064	0.284	0.00	1.048
0.80	0.048	0.255	0.00	1.103
0.90	0.032	0.227	0.00	1.159
1.00	0.017	0.198	0.00	1.215
1.10	0.001	0.169	0.00	1.27
1.20	0.00	0.132	0.00	1.332
1.30	0.00	0.094	0.00	1.394
1.40	0.00	0.057	0.00	1.457

"Extreme" hydrologic conditions defined by above average precipitation recharge (9.85 in/yr) and below average Mississippi River stage (602.10 ft AMSL).

Table 11. Minimum Pumping Rates Required for Hydraulic Gradient Control Given Abandonment of PW-5.

Average Conditions				
Minimum Pumping Rate (mgd)				Total Rate (mgd)
PW-5	PW-3A	PW-4A	PW-7A	
0.00	0.137	0.296	0.410	0.843
0.00	**0.00**	0.602	0.325	0.927
0.00	0.696	**0.00**	0.383	1.079
0.00	0.00	1.431	**0.00**	1.431
Extreme Conditions				
Minimum Pumping Rate (mgd)				Total Rate (mgd)
PW-5	PW-3A	PW-4A	PW-7A	
0.00	0.112	0.370	0.400	0.882
0.00	**0.00**	0.620	0.332	0.952
0.00	0.807	**0.00**	0.370	1.177
0.00	0.00	1.485	**0.00**	1.485

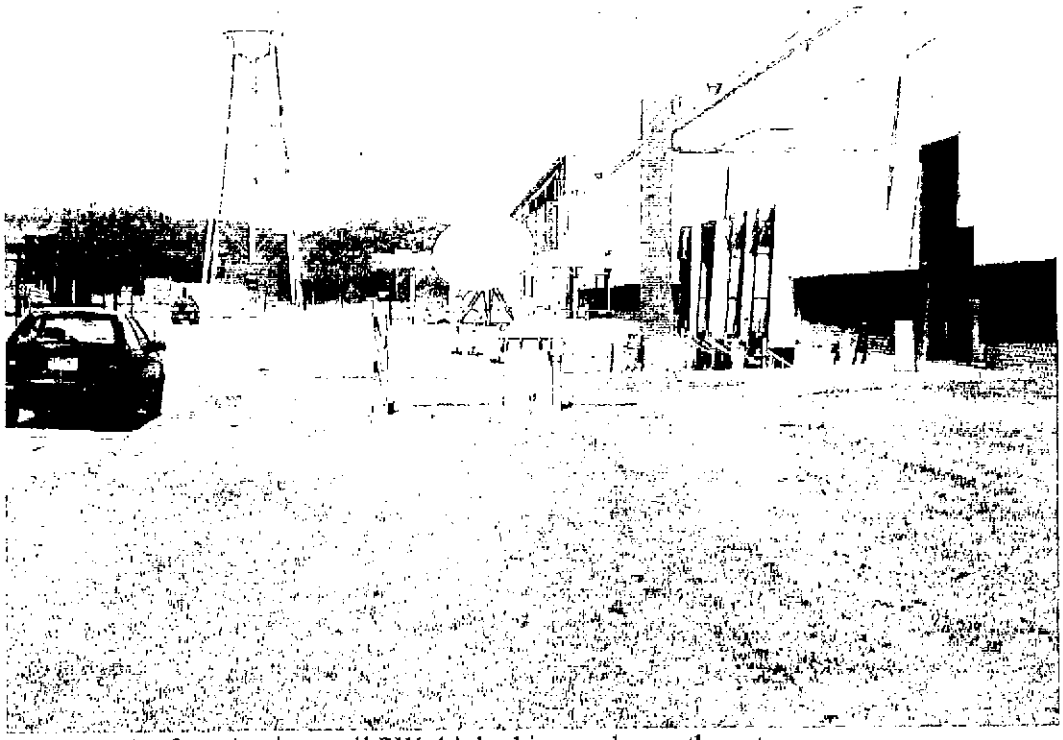
"Average" hydrologic conditions defined by calibrated steady-state flow model.

"Extreme" hydrologic conditions defined by above average precipitation recharge (9.85 in/yr) and below average Mississippi River stage (602.10 ft AMSL).

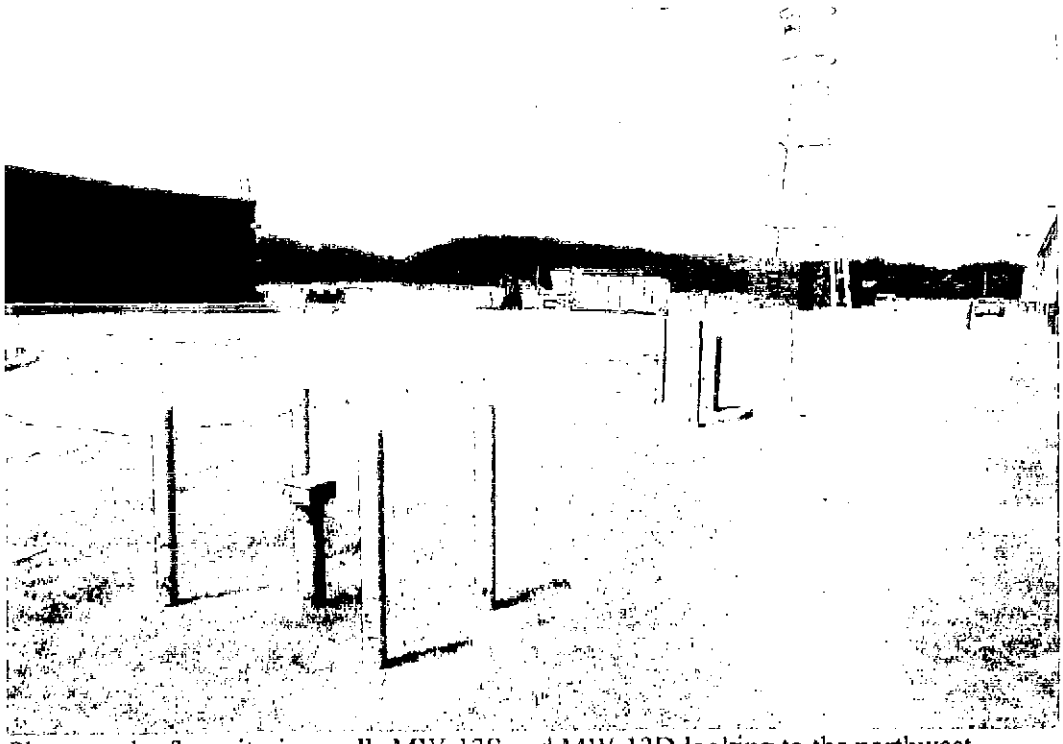
Bold numbers denote the well has been fixed at 0.0 MGD for maintenance

JOHN DEERE DUBUQUE WORKS
AUGUST 7, 2003 SITE INSPECTION
PHOTOGRAPH LOG

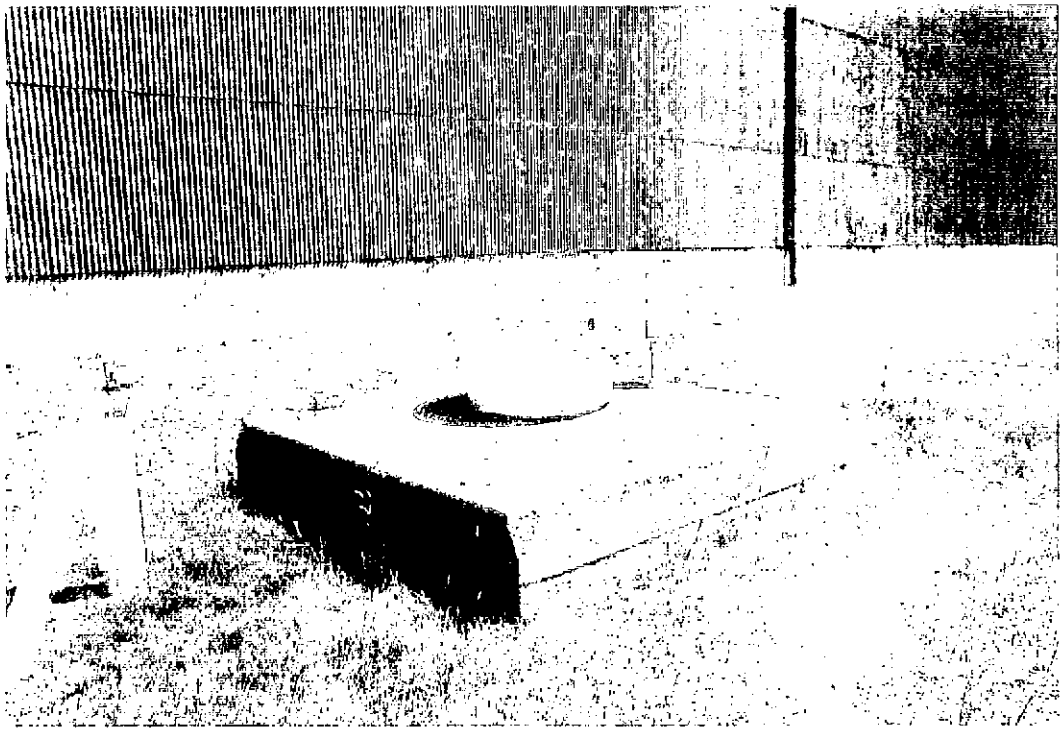
G:/proj/tf1034/2003/5-Year Review/August 7, 2003
Site Inspection Photographs 1 to 3



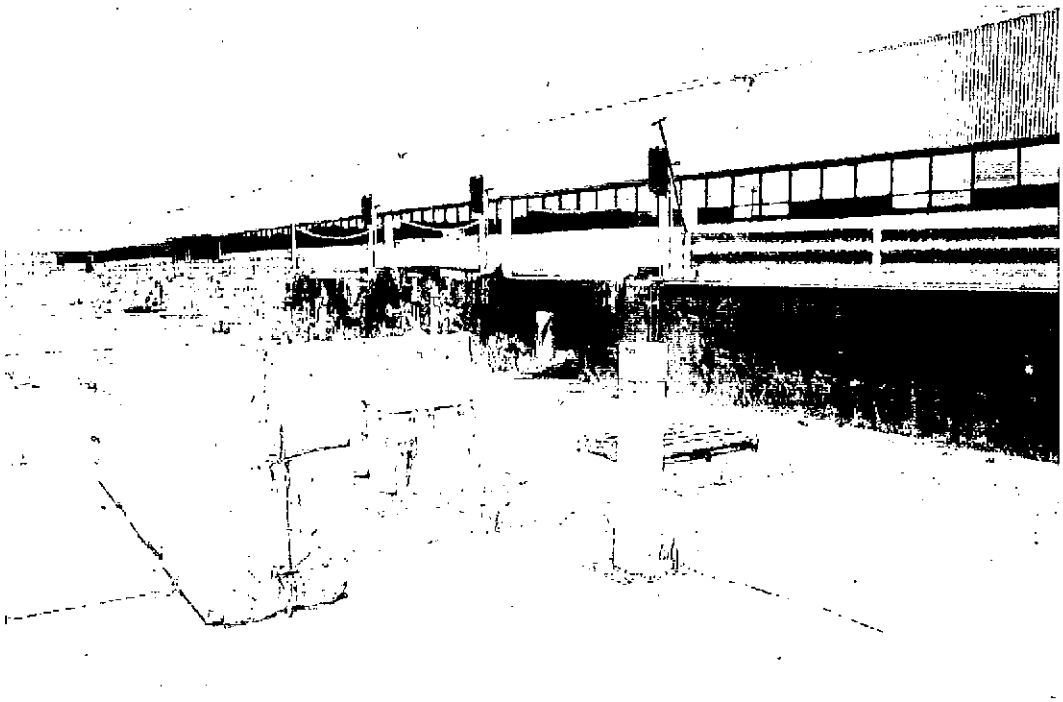
Photograph of production well PW-4A looking to the northwest.



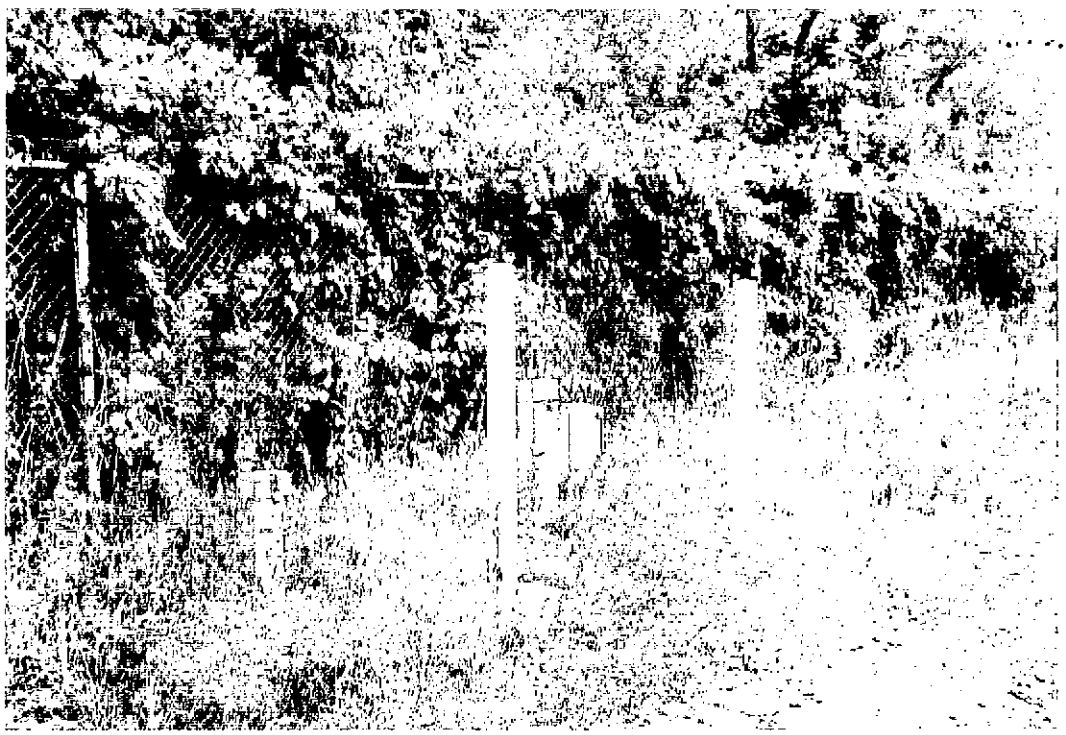
Photograph of monitoring wells MW-13S and MW-13D looking to the northwest.



Photograph of production well PW-5 and recovery well RW-5 looking to the southeast.



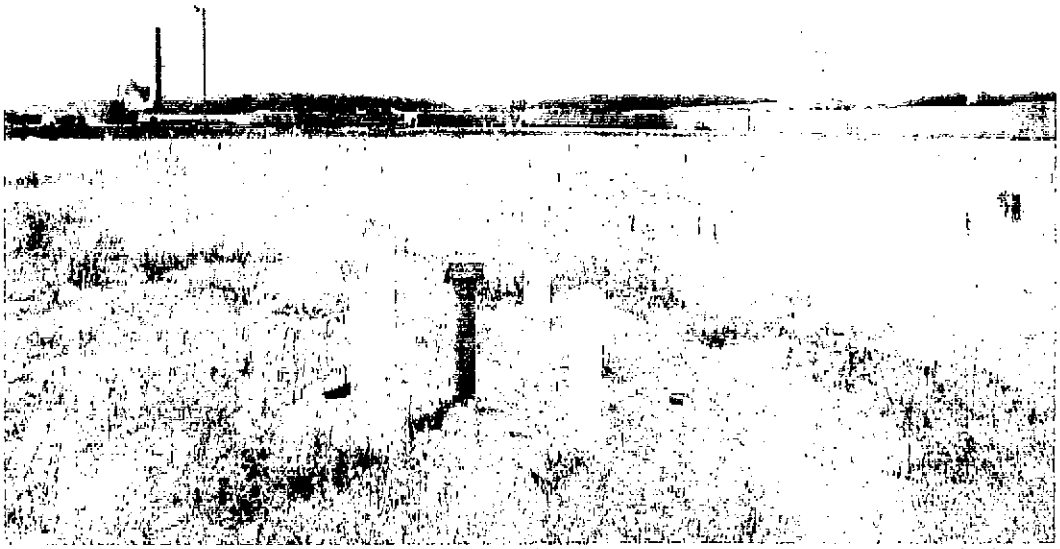
Photograph of production well PW-3A and recovery well RW-3A looking to the northeast



Photograph of perimeter monitoring wells MW-11S and MW-11D looking to the southeast.

Photograph of soil boring monitoring well SBW-4 looking to the north.

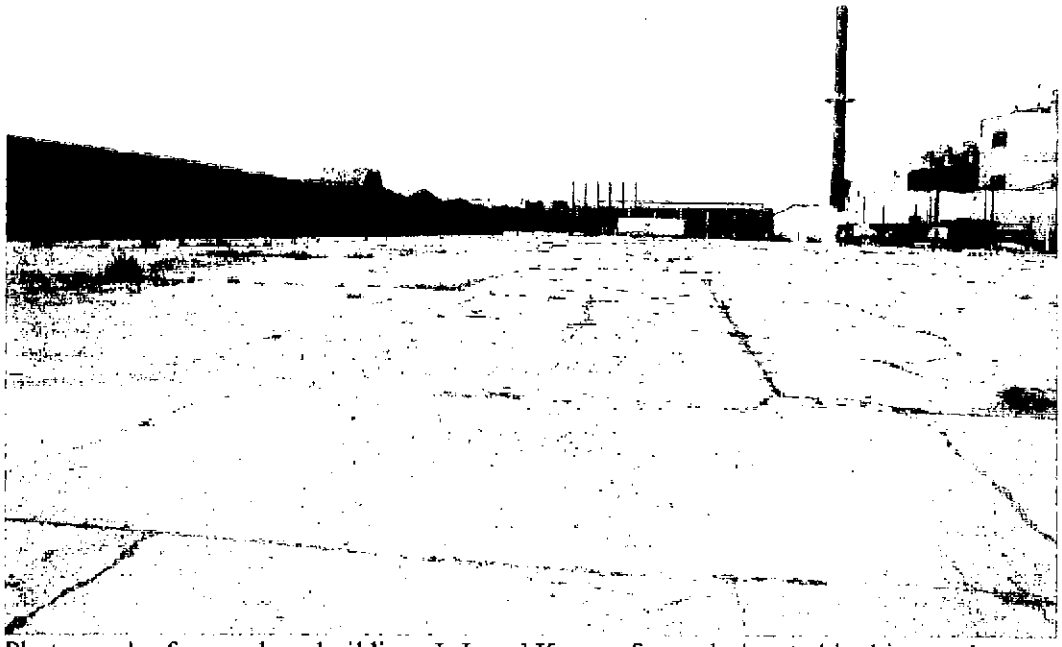
Photograph of perimeter monitoring well MW-10 looking to the north.



Photograph of monitoring well MW-9S looking to the south/southwest where buildings U, V and V-1, which were demolished in 2003, were formerly located.

Photograph of perimeter monitoring well MW-5N looking to the northeast.

Photograph of monitoring well MW-6 looking to the south.



Photograph of area where buildings I, J, and K were formerly located looking to the north/northwest.

Photograph of perimeter monitoring well MW-20S looking to the north/northeast.

Photograph of perimeter monitoring well MW-1 looking to the east.

Photograph of monitoring well MW-2 looking to the west.

Appendix E

Performance Standard Calculations

1,1-Dichloroethane

$$C(mg/L) = \frac{THI \times BW \times AT \times 365\ days/year}{EF \times ED \times [(\frac{1}{RfD_i} \times K \times IR_a) + (\frac{1}{RfD_o} \times IR_w)]}$$

Parameters	Definition	Default Value
C	Chemical Concentration in water mg/L	-
THI	Target Hazard Index (unitless)	1
RfD_o	Oral Reference Dose (mg/kg-day)	1.0×10^{-1} mg/kg-day
RfD_i	Inhalation Reference Dose (mg/kg-day)	1.4×10^{-1} mg/kg-day
BW	Adult Body Weight (kg)	70 kg
AT	Averaging Time (yr)	30 yr
EF	Exposure Frequency (days/yr)	350 days/yr
ED	Exposure Duration (yr)	30 yr
IR_a	Daily Indoor Inhalation Rate (m^3/day)	15 m^3/day
IR_w	Ingestion Rate (L/day)	2 L/day
K	Volatilization Factor (L/m^3)	0.5 L/m^3

$$C(mg/L) = \frac{73}{\frac{7.5}{0.14} + \frac{2}{0.1}} = 0.99\ mg/L$$

Source: Risk Assessment Guidance for Superfund, Human Health Evaluation Manual (Part B, Development of Risk-Based Preliminary Remediation Goals), p. 22.

1,1,2,2-Tetrachloroethane

$$C(mg/L) = \frac{TR \times BW \times AT \times 365\ days/year}{EF \times ED \times [(SF_i \times K \times IR_a) + (SF_o \times IR_w)]}$$

Parameters	Definition	Default Value
C	Chemical Concentration in water mg/L	-
TR	Target Excess Individual Lifetime Cancer Risk (unitless)	10^{-6}
SF_o	Oral Slope Factor $(mg/kg\text{-}day)^{-1}$	2.0×10^{-1} $mg/kg\text{-}day^{-1}$
SF_i	Inhalation Slope Factor $(mg/kg\text{-}day)^{-1}$	2.0×10^{-1} $mg/kg\text{-}day^{-1}$
BW	Adult Body Weight (kg)	70 kg
AT	Averaging Time (yr)	70 yr
EF	Exposure Frequency (days/yr)	350 days/yr
ED	Exposure Duration (yr)	30 yr
IR_a	Daily Indoor Inhalation Rate (m^3/day)	15 m^3/day
IR_w	Ingestion Rate (L/day)	2 L/day
K	Volatilization Factor (L/m^3)	0.5 L/m^3

$$C(mg/L) = \frac{1.7 \times 10^{-4}}{(7.5 \times 0.2) + (2 \times 0.2)} = 8.95 \times 10^{-5}\ mg/L$$

Source: Risk Assessment Guidance for Superfund, Human Health Evaluation Manual (Part B, Development of Risk-Based Preliminary Remediation Goals), p. 23.

Hexavalent Chromium

$$C(mg/L) \quad \frac{THI \times BW \times AT \times 365\ days/year}{EF \times ED \times [(\frac{1}{RfD_i} \times K \times IR_a \quad \frac{1}{RfD_o} \times IR_w)]}$$

Parameters	Definition	Default Value
C	Chemical Concentration in water mg/L	-
THI	Target Hazard Index (unitless)	1
RfD_o	Oral Reference Dose (mg/kg-day)	3×10^{-3}
RfD_i	Inhalation Reference Dose (mg/kg-day)	none
BW	Adult Body Weight (kg)	70 kg
AT	Averaging Time (yr)	30 yr
EF	Exposure Frequency (days/yr)	350 days/yr
ED	Exposure Duration (yr)	30 days/yr
IR_a	Daily Indoor Inhalation Rate (m^3/day)	15 m^3/day
IR_w	Ingestion Rate (L/day)	2 L/day
K	Volatilization Factor (L/m^3)	0.5 L/m^3

$$C(mg/L) = \frac{73}{(\frac{2}{0.003})} = 0.110\ mg/L$$

Source: Risk Assessment Guidance for Superfund, Human Health Evaluation Manual (Part B, Development of Risk-Based Preliminary Remediation Goals), p. 22.